Raport Badawczy

Research Report

RB/27/2002

Materiały Międzynarodowego Seminarium „Strategia rozwoju obszarów wiejskich" Cz. II

W. Ciechanowicz, Z. Uhrynowski

Instytut Badań Systemowych
Polska Akademia Nauk

Systems Research Institute
Polish Academy of Sciences

POLSKA AKADEMIA NAUK

Instytut Badań Systemowych

ul. Newelska 6

01-447 Warszawa

tel.: (+48) (22) 8373578

fax: (+48) (22) 8372772

Kierownik Pracowni zgłaszający pracę:
Dr inż. Piotr Holnicki

Warszawa 2002

BIOENERGIA NA RZECZ ROZWOJU WSI

Materiały

Międzynarodowego Seminarium
poświęconego
Strategii Rozwoju Obszarów Wiejskich

Warszawa, Pałac Staszica
4 października, 2002

Zorganizowanego przez
Wydział IV Nauk Technicznych PAN
przy udziale
Konsorcjum „Bioenergia na Rzecz Rozwoju Wsi" oraz Instytutu Badań Systemowych PAN

Opracowanie
Wiesław Ciechanowicz, Zygmunt Uhrynowski

Autorzy
Barney Foran, Wiesław Ciechanowicz,
Stefan Szczukowski, Zygmunt Uhrynowski

Temat:
Strategia Rozwoju Obszarów Wiejskich
Perspektywy Przejścia do Gospodarki Opartej na Bioenergii

IBS PAN
Warszawa, październik 2002

Developing Biofuel Economy in Australia

by

Barney Foran
CSIRO Resource Futures, Australia

Presented on
International Seminar on Bioenergy Strategies for Rural Development

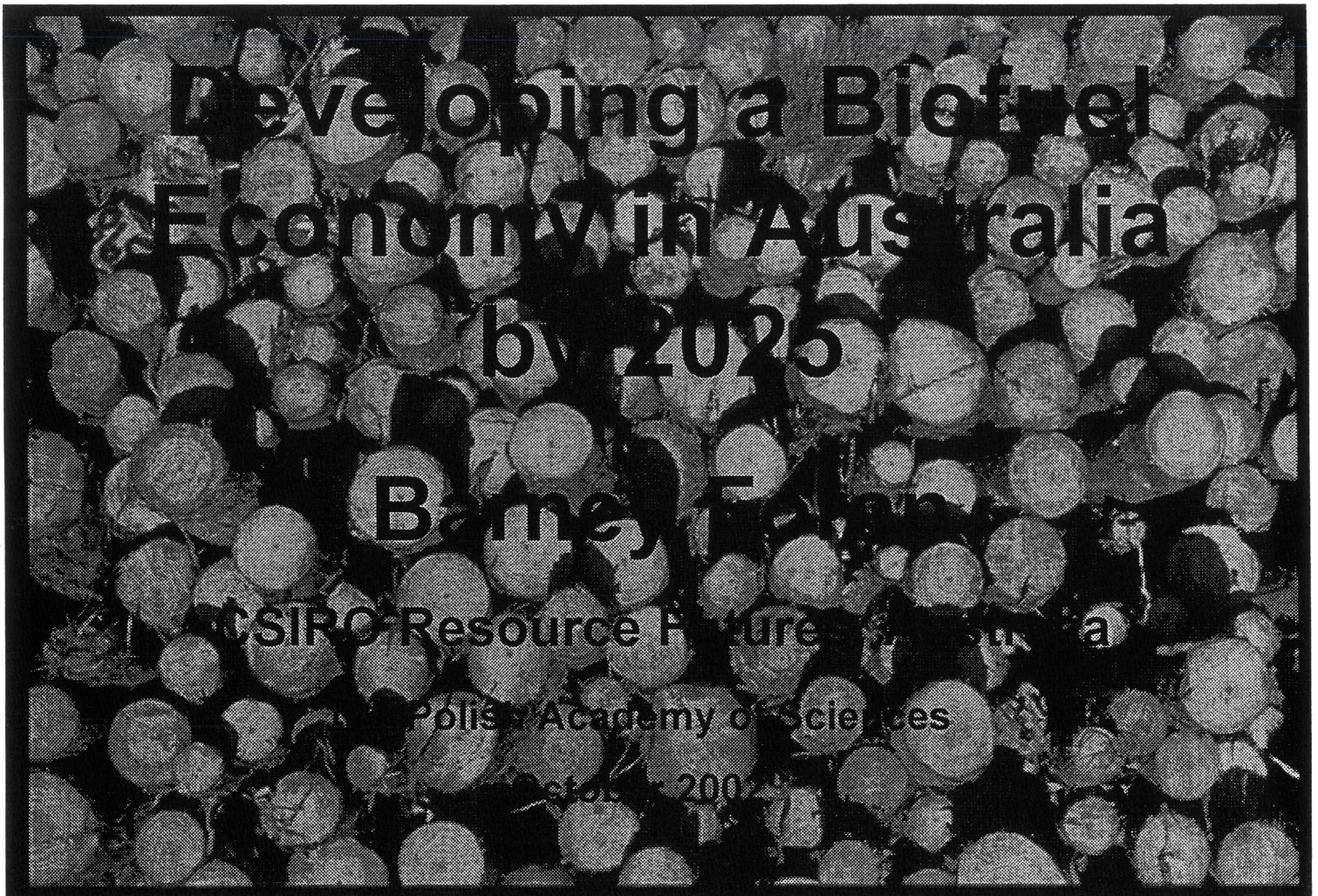
Printed Matters

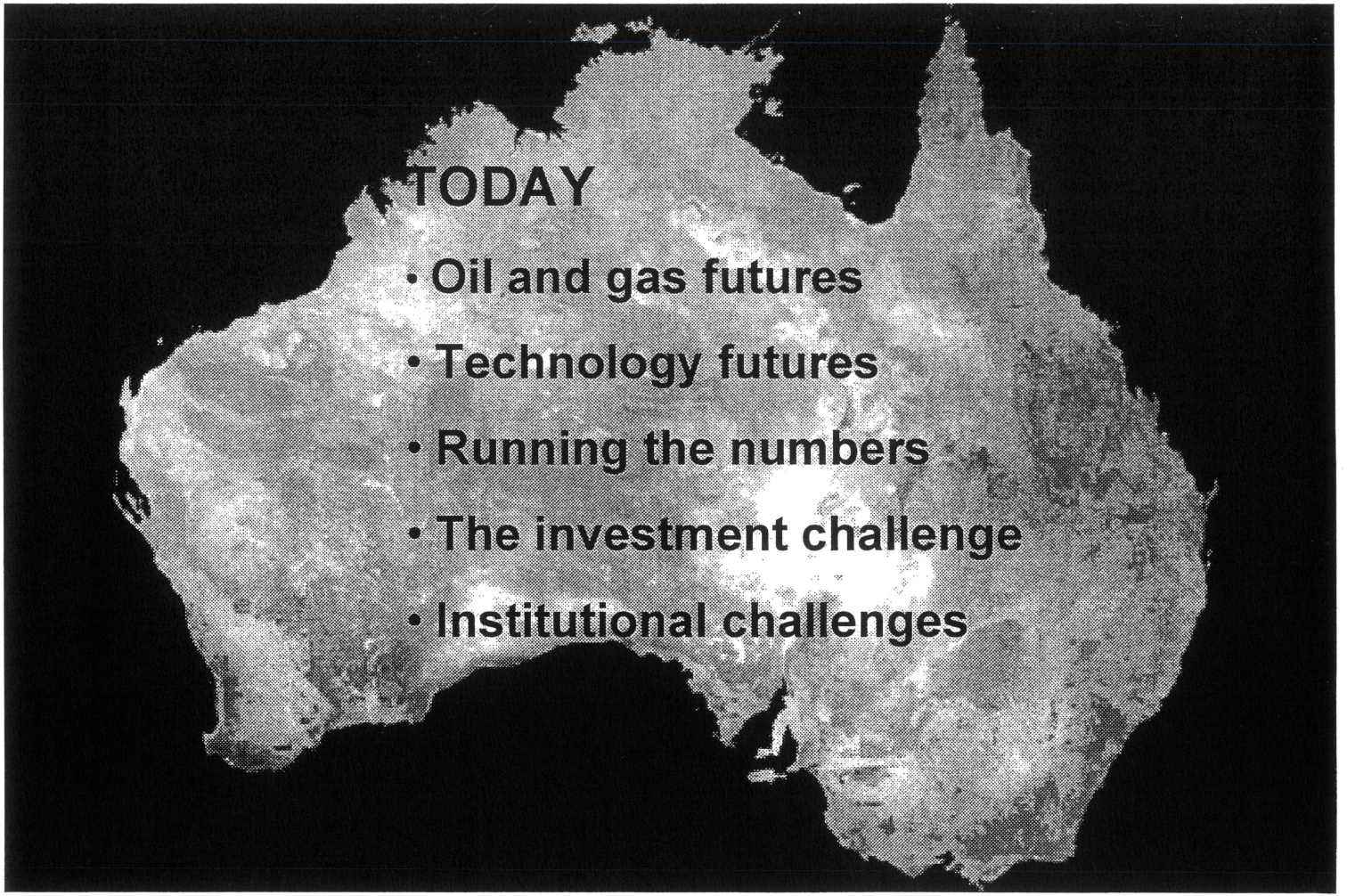
Warsaw, Palais of Staszic,
October 4, 2002

Organized by

Department IV of Technical Sciences
of Polish Academy of Sciences
together with
Consortium „ Bioenergy for Rural Development"
and
Systems Research Institute

Warsaw, 2002

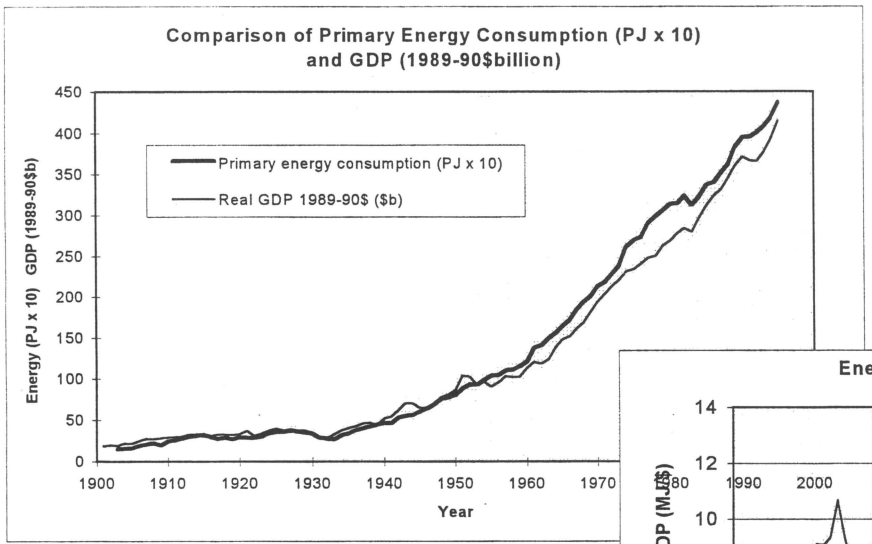

Developing a Biofuel Economy in Australia by 2025
Barney Foran
CSIRO Resource Future
Polish Academy of Sciences
October 2002


TODAY
• Oil and gas futures
• Technology futures
• Running the numbers
• The investment challenge
• Institutional challenges

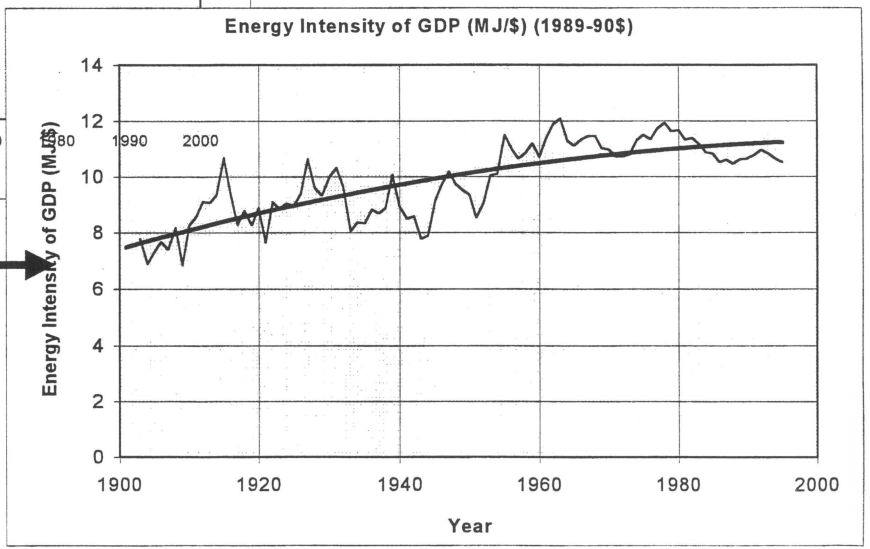
Centrality of Energy

- Energy inputs in modern economies are responsible for 50% of economic production but only about 5-10% of input (factor) costs (Kummell and Lindenberger, 1998 and 2000)
- Ecological prices of fossil energy are 5-7 times higher than the market prices (using the ecological pricing approaches developed by Costanza et al. (1997) and applied by Patterson (2002)
- The eMergy approaches developed by HT Odum suggest that oil at US25 per barrel is underpriced in 'system process' terms by a factor of 10

Energy and the Australian Economy

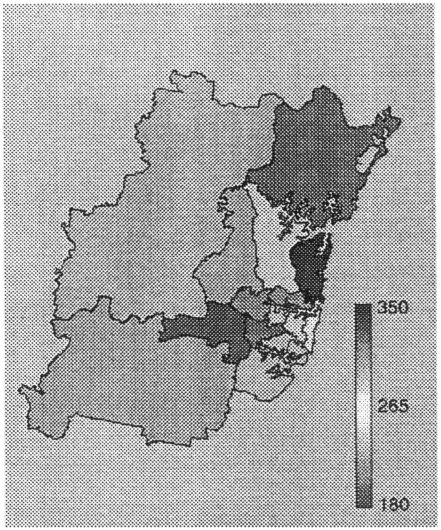


USE
$ and energy 1900-1996

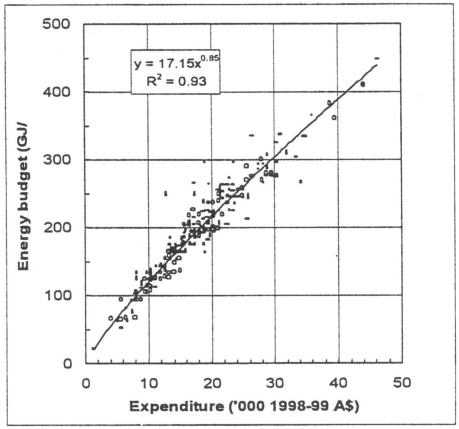


INTENSITY
energy/$ 1900-1996

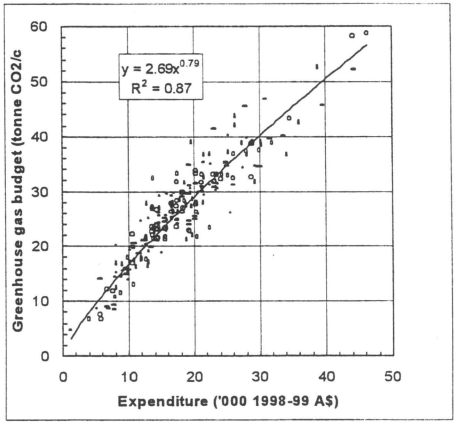
Energy Use per Capita



GJ per capita



GJ per capita

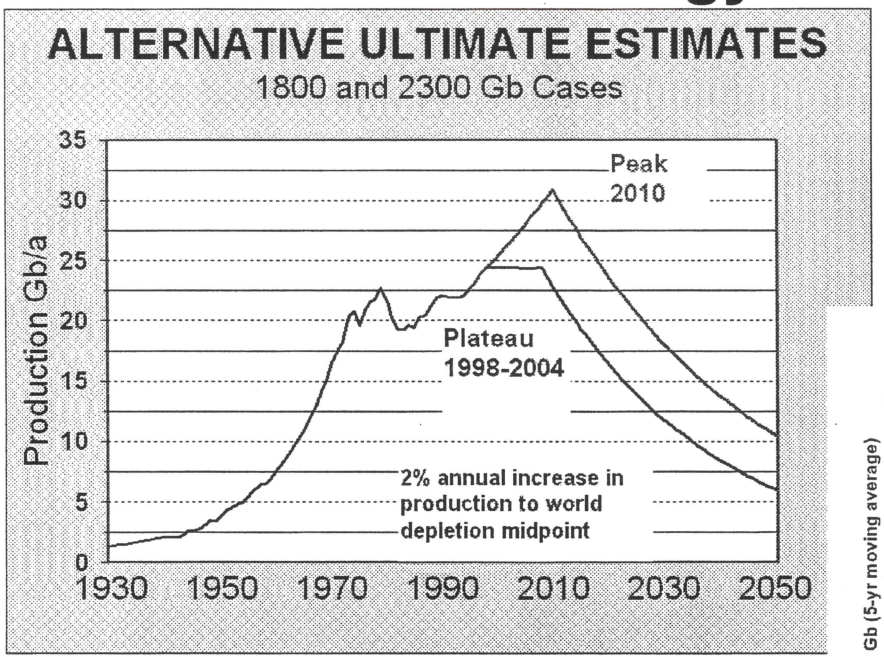


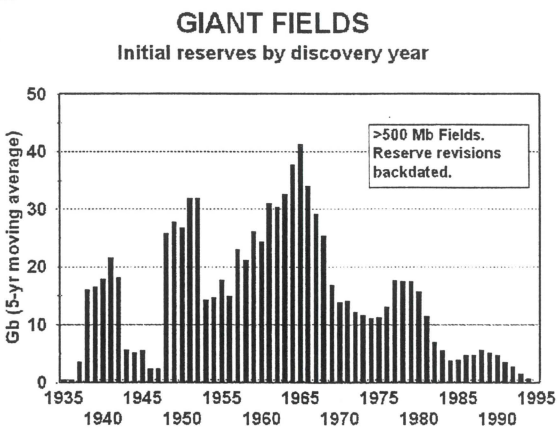
Tonnes GHG per capita

CSIRO Resource Futures

Source: Lenzen and Dey, Applied Physics, University of Sydney

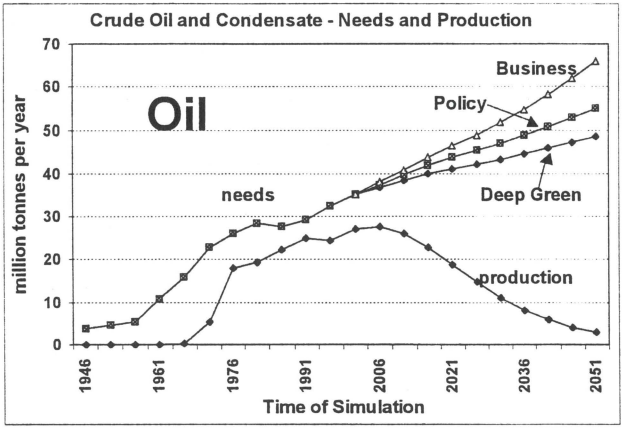
Driver 5: Energy Futures

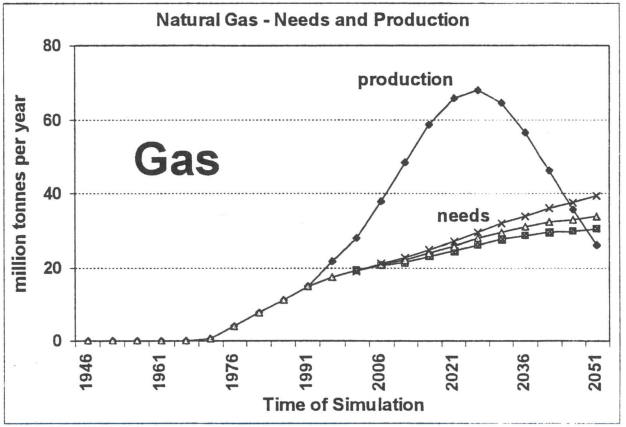




- Is petroleum a stock or a flow ?
- The era of relatively cheap, easily available petroleum
- Rangelands and new energy production

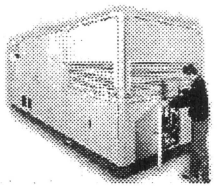
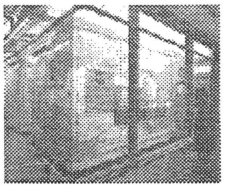
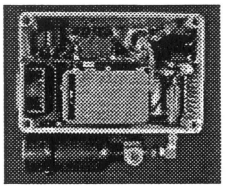
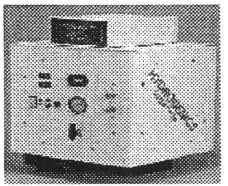
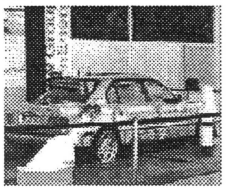
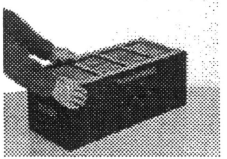
Possible Oil and Gas Futures



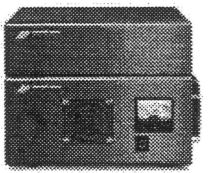


Fuel Cells

Fuel Cells are here today

Power



Vehicles

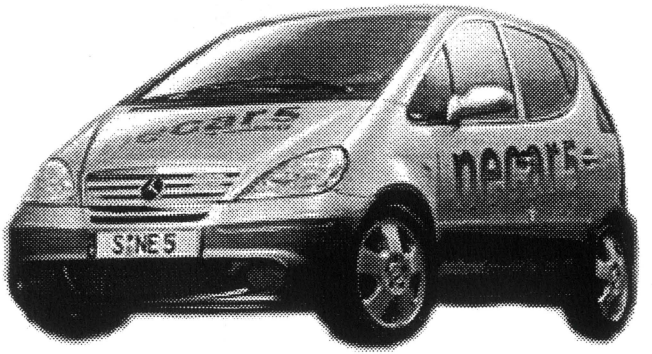
All of these projects are out in the real world,

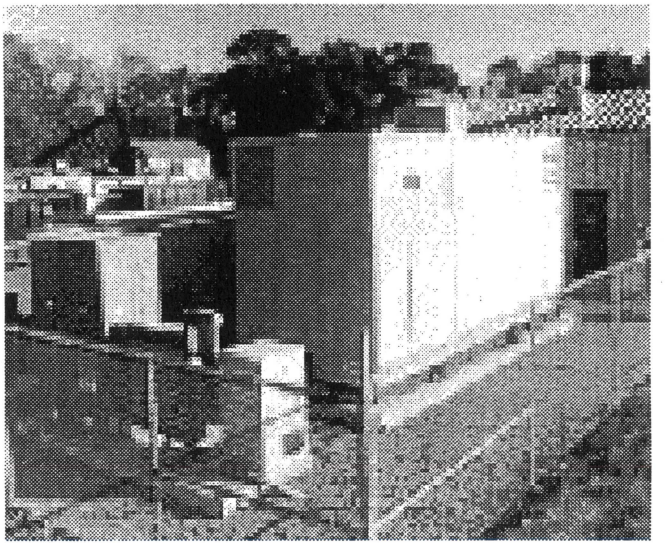
showing the power and energy of fuel cells today.

eduction activi-
ives: 1) Reduce
o existing tech-
commercially vi-

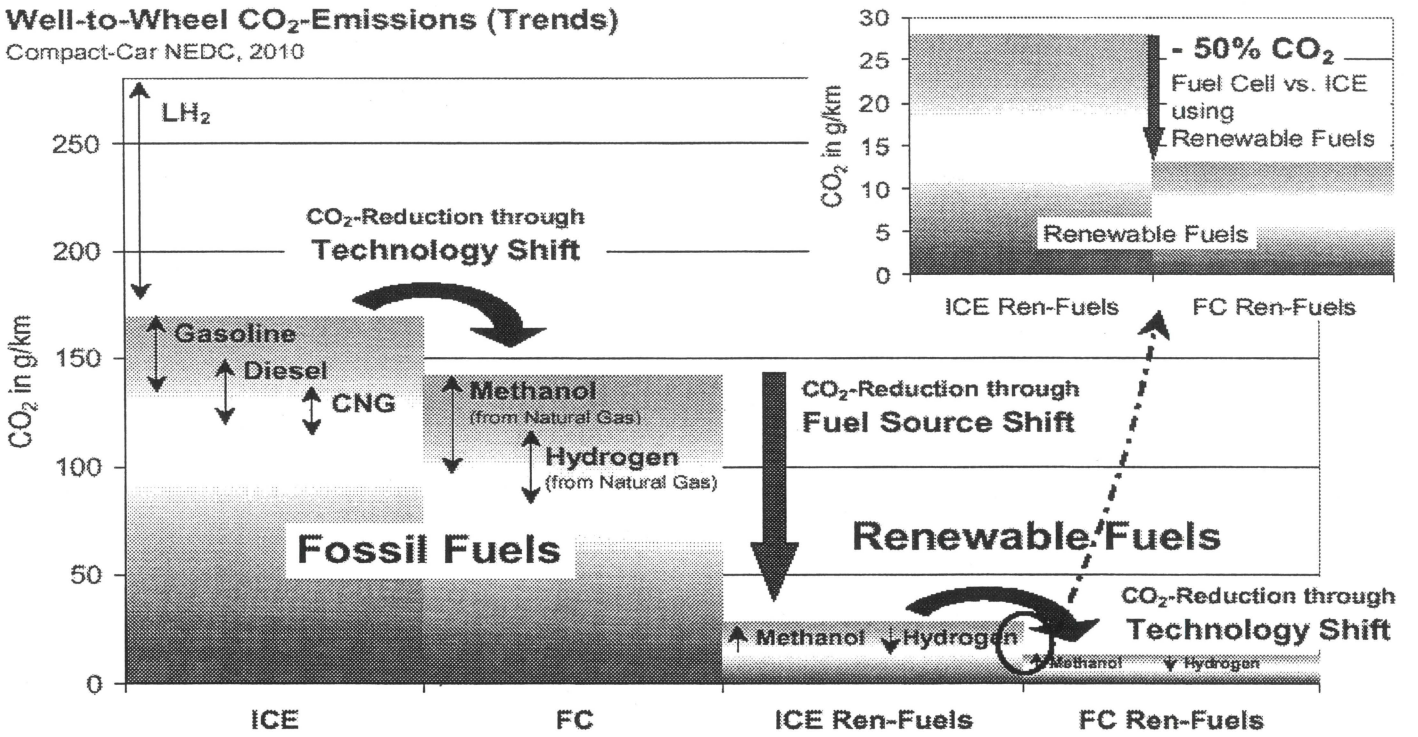
The Evolution of MicroFuel Cells at Motorola

For technologies immersed in the global wireless revolution on a day-to-day basis, it has become clear that the battery technology of yesterday can no longer adequately power the wireless products of today, let alone those of the future. With increased functionality and the need for multimedia, on-body energy requirements are expected to leap to 10,000+ Whrs by the year 2010. At Motorola Labs, one potential solution to the evolving power demand is a 1W Direct Methanol Fuel Cell (DMFC). This solution must provide the desired power, at a size that can be easily integrated into the portable de-





Engines and Fuel Cell Electric Vehicles



Quelle: Isenberg FT1/E, Edinger FT4, *Kraftstoffwende*, März 2001. Daten nach VES und DaimlerChrysler.

Alcohol Fuels from Biomass

METHANOL

- Thermal process
- Yields of 40% and up to 50% by weight
- Well developed industrially

ETHANOL

- Biological digestion process
- Yields of 16% (wood) to 40% (sugar cane)
- Still developing: carbohydrate economy

Three Transitional Pathways to a Biomass Fuel Cycle

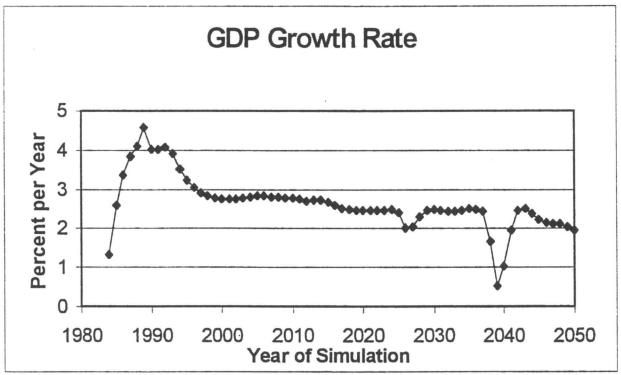
- The BASE CASE
- METHANOL plus biomass electricity
- ETHANOL plus biomass electricity
- A RADICAL ECONOMY based on methanol

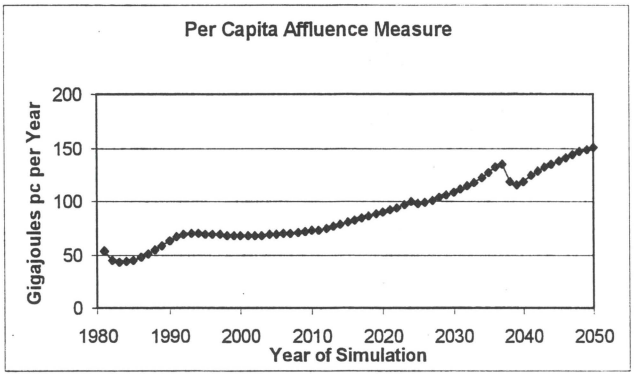
JUDGING FEASIBILITY

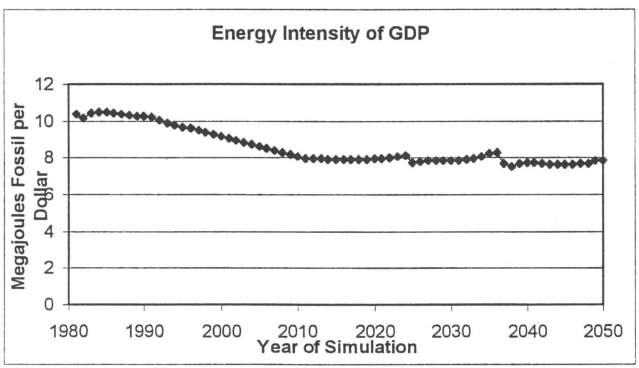
- GDP growth rate and per capita physical affluence
- CO2 emissions, energy intensity of GDP, employment
- Biomass area, energy ratio, oil import replacement

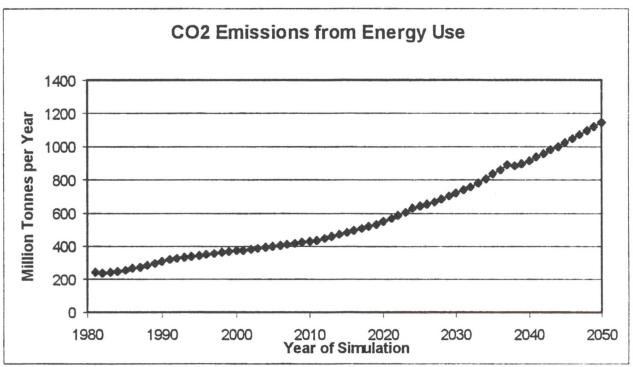
Headline Indicators for Whole Economy

Base Case 1980 to 2050



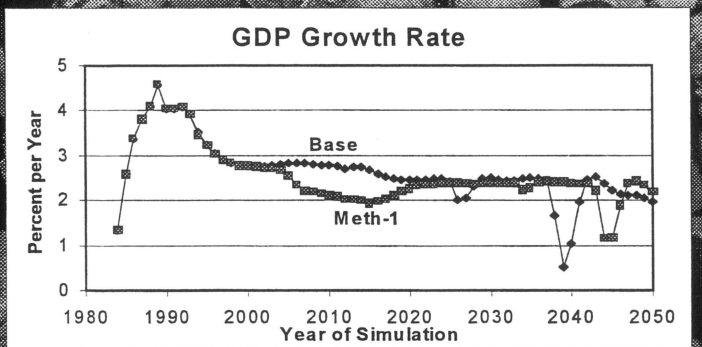


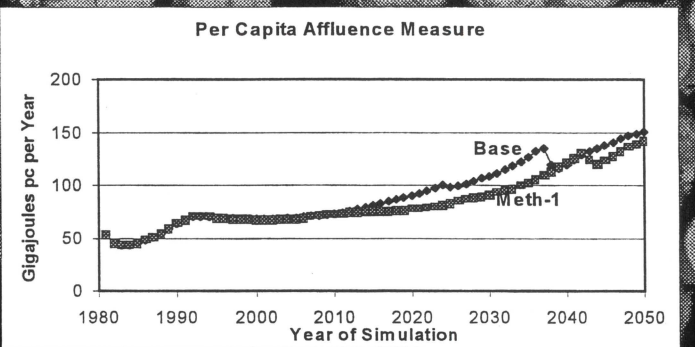


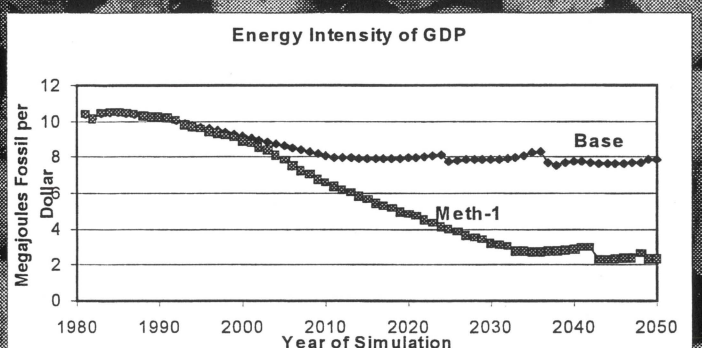


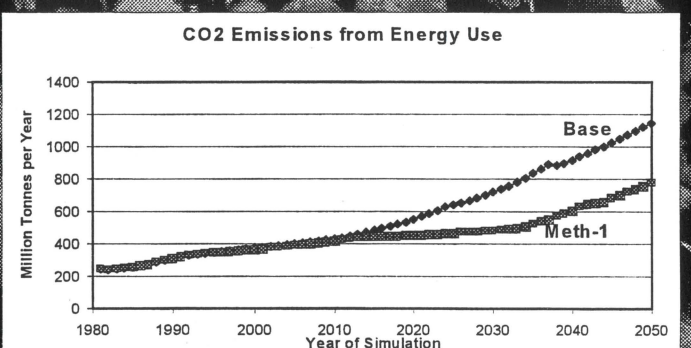
Headline Indicators for Whole Economy

Methanol + Biomass Electricity, 1980 to 2050



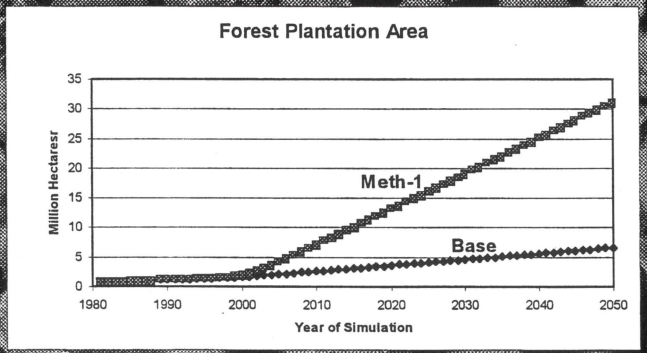


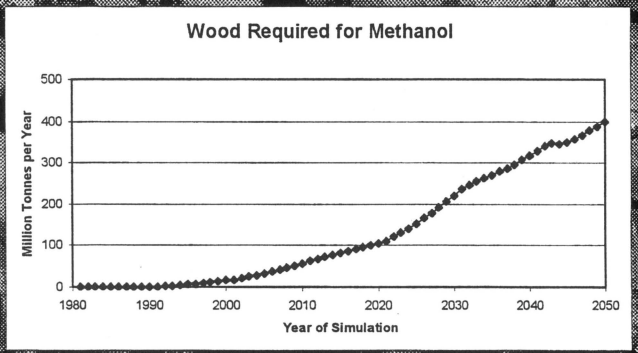


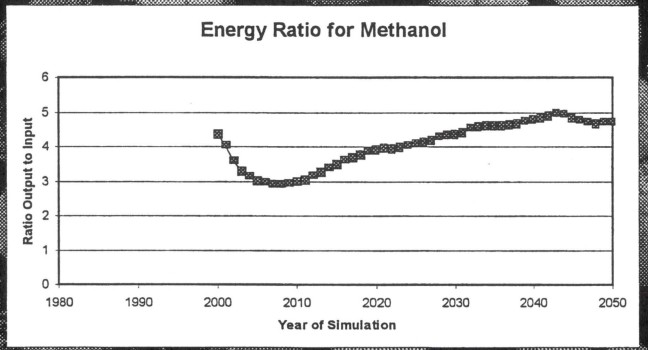


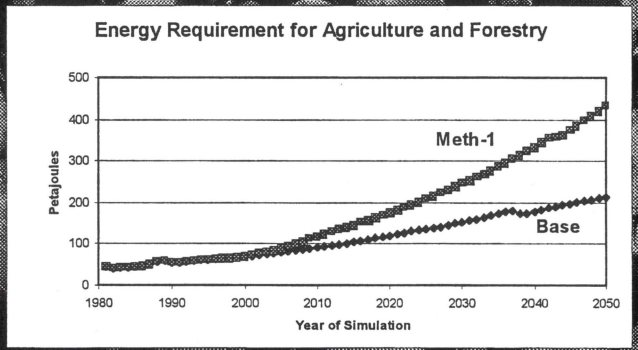
Biophysical Indicators

Methanol + Biomass Electricity 1980 to 2050



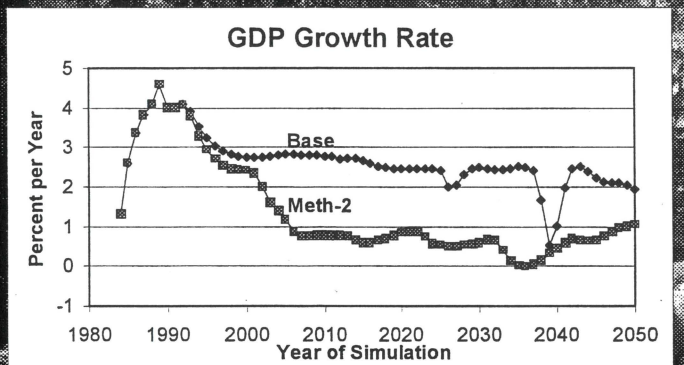


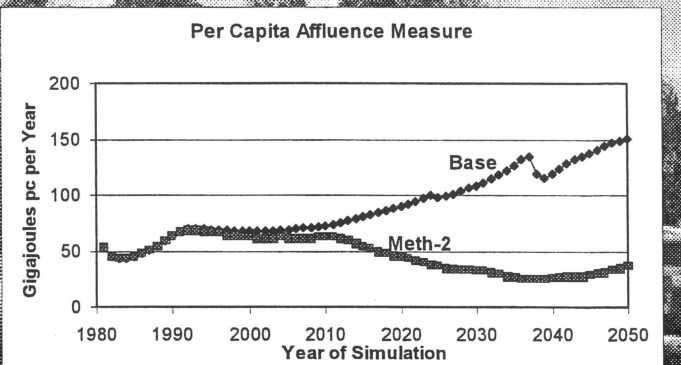


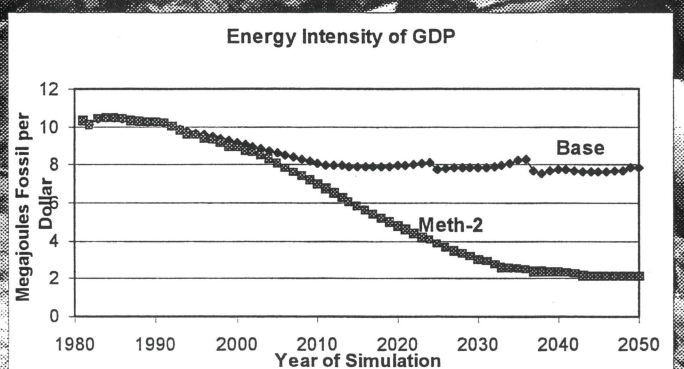


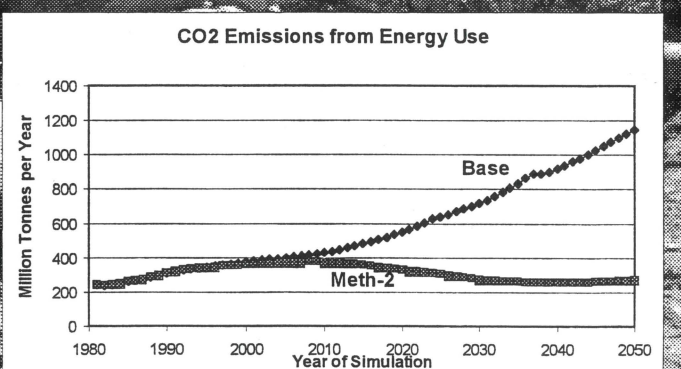
Headline Indicators for Whole Economy

A Radical Economy 1980 to 2050



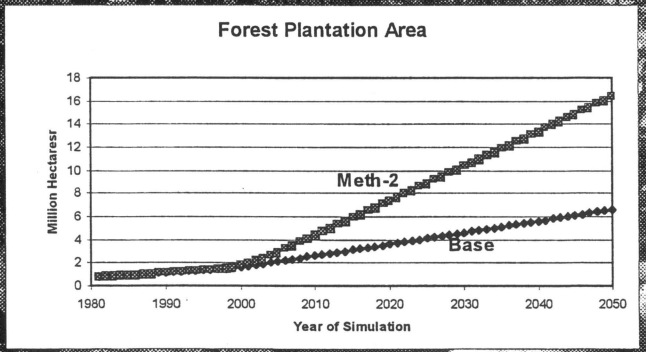


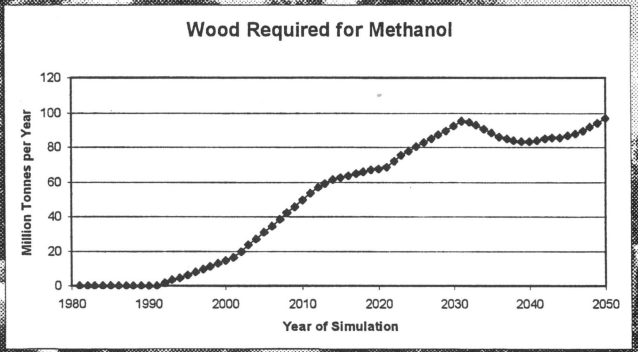


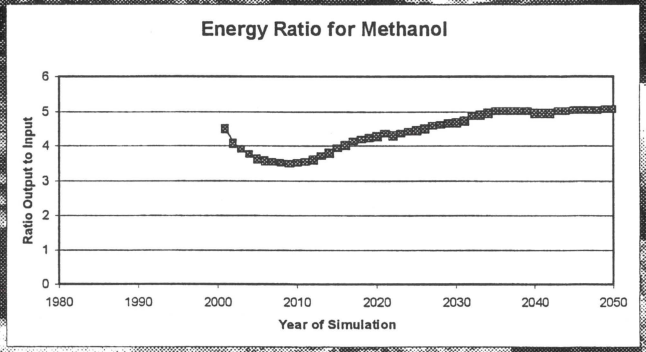


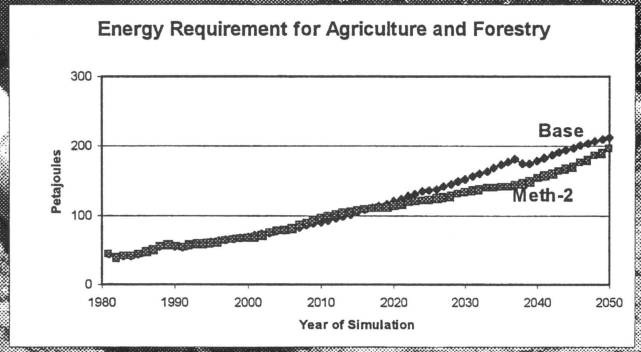
Biophysical Indicators

A Radical Economy 1980 to 2050

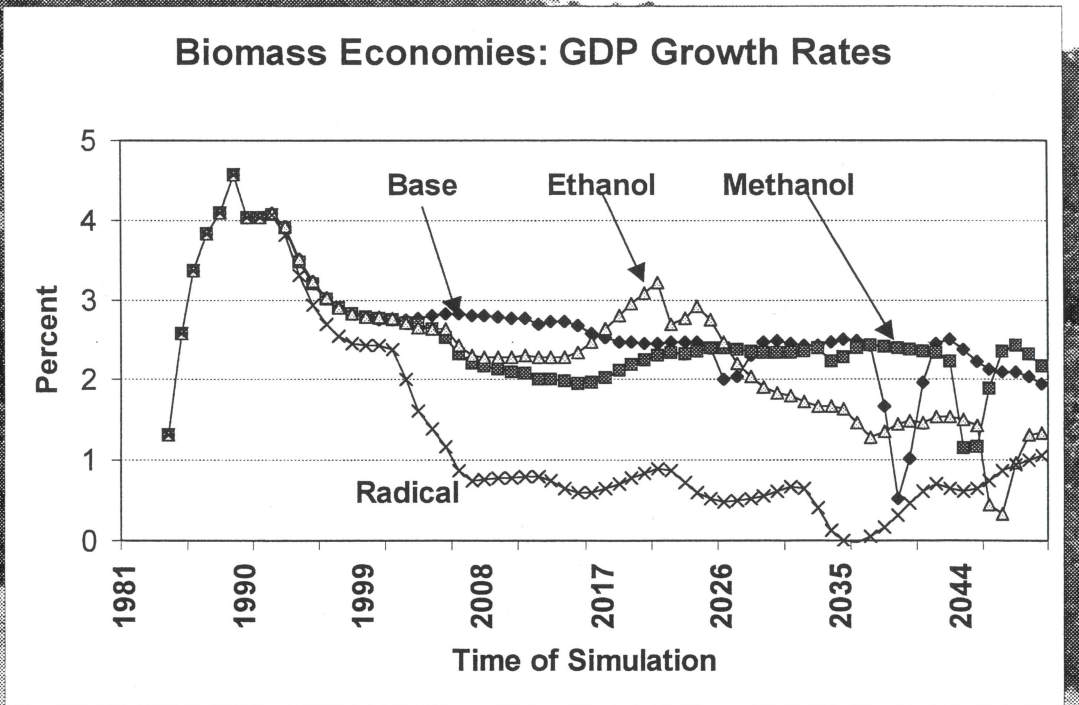




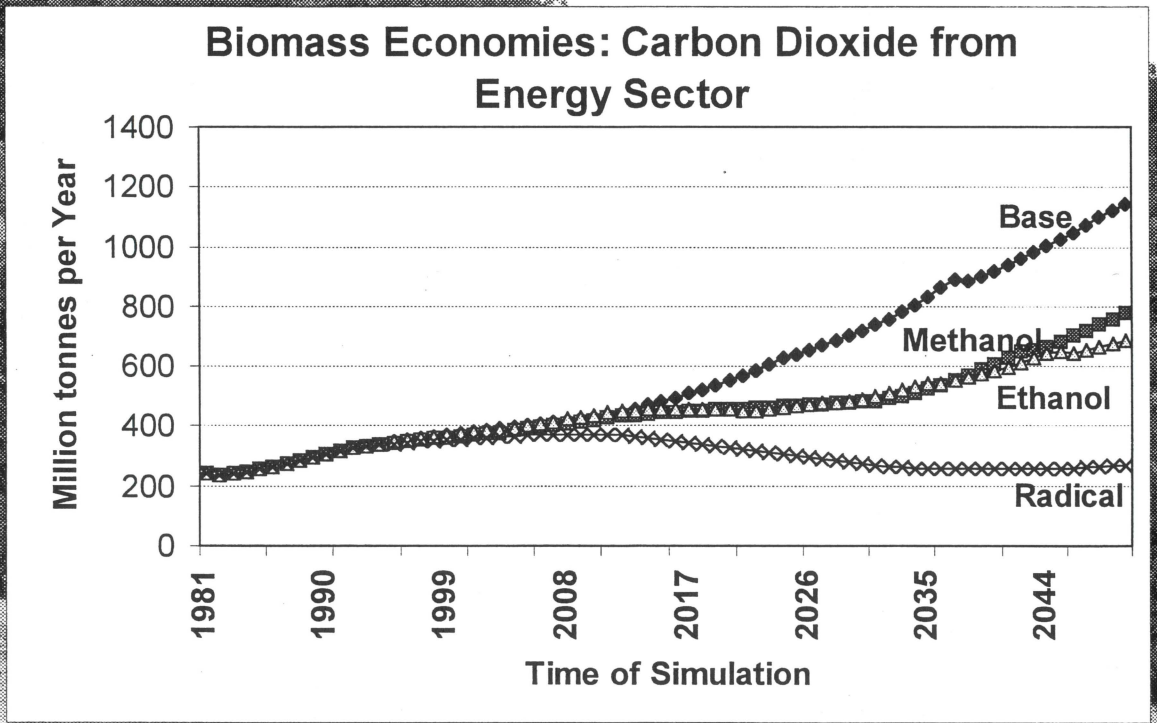




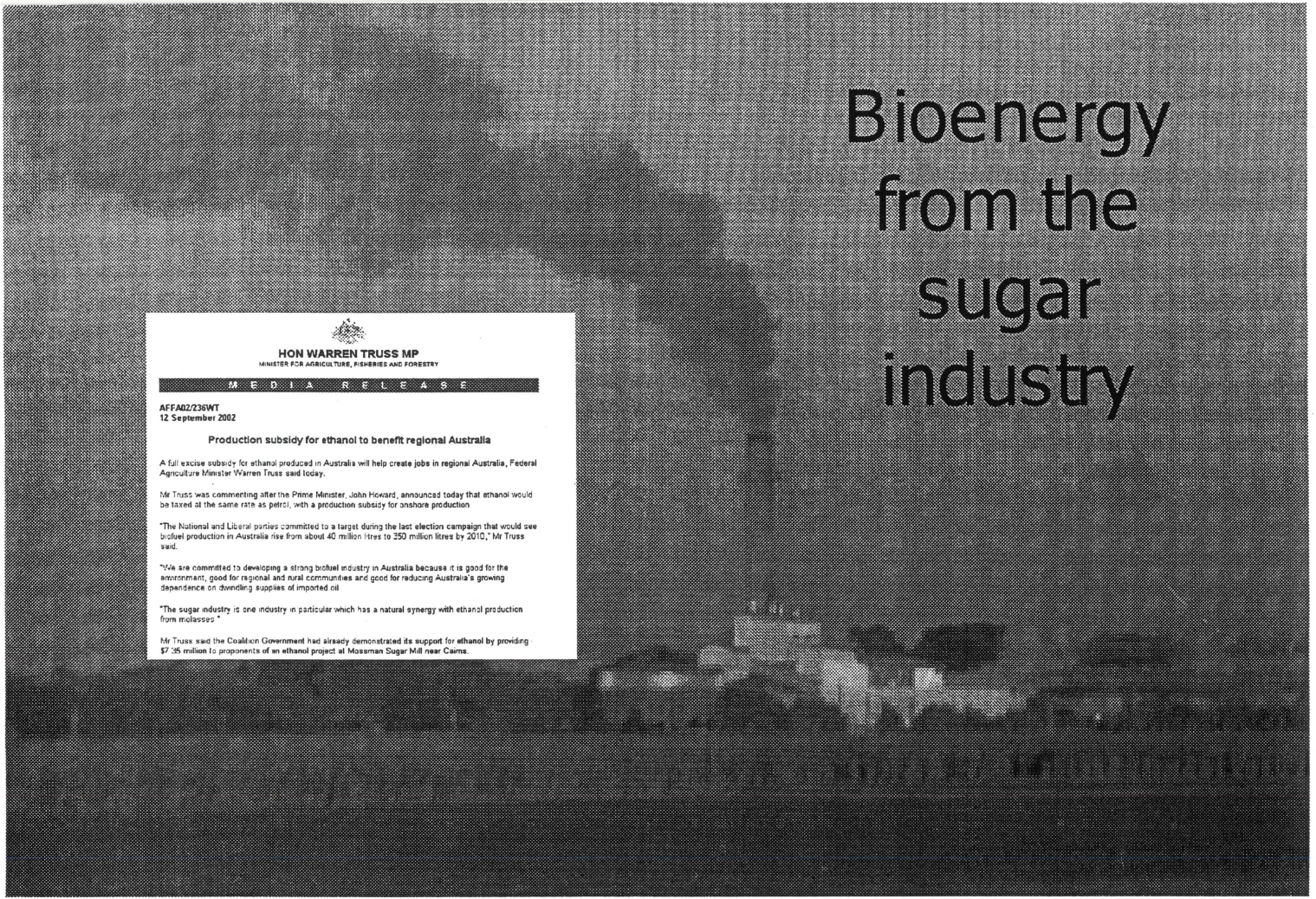
Comparison: GDP Growth Rates



Comparison: Carbon Dioxide Emissions



Bioenergy from the sugar industry



HON WARREN TRUSS MP
MINISTER FOR AGRICULTURE, FISHERIES AND FORESTRY

M E D I A R E L E A S E

AFFA02/236WT
12 September 2002

Production subsidy for ethanol to benefit regional Australia

A full excise subsidy for ethanol produced in Australia will help create jobs in regional Australia, Federal Agriculture Minister Warren Truss said today.

Mr Truss was commenting after the Prime Minister, John Howard, announced today that ethanol would be taxed at the same rate as petrol, with a production subsidy for onshore production

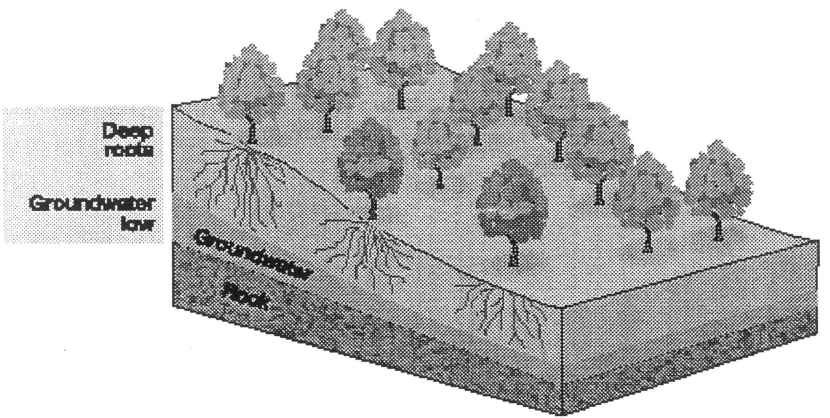
"The National and Liberal parties committed to a target during the last election campaign that would see biofuel production in Australia rise from about 40 million litres to 350 million litres by 2010," Mr Truss said.

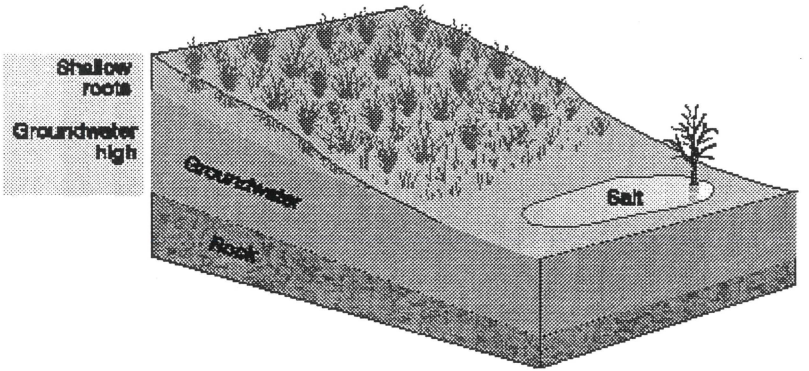
"We are committed to developing a strong biofuel industry in Australia because it is good for the environment, good for regional and rural communities and good for reducing Australia's growing dependence on dwindling supplies of imported oil

"The sugar industry is one industry in particular which has a natural synergy with ethanol production from molasses."

Mr Truss said the Coalition Government had already demonstrated its support for ethanol by providing $7.35 million to proponents of an ethanol project at Mossman Sugar Mill near Cairns.

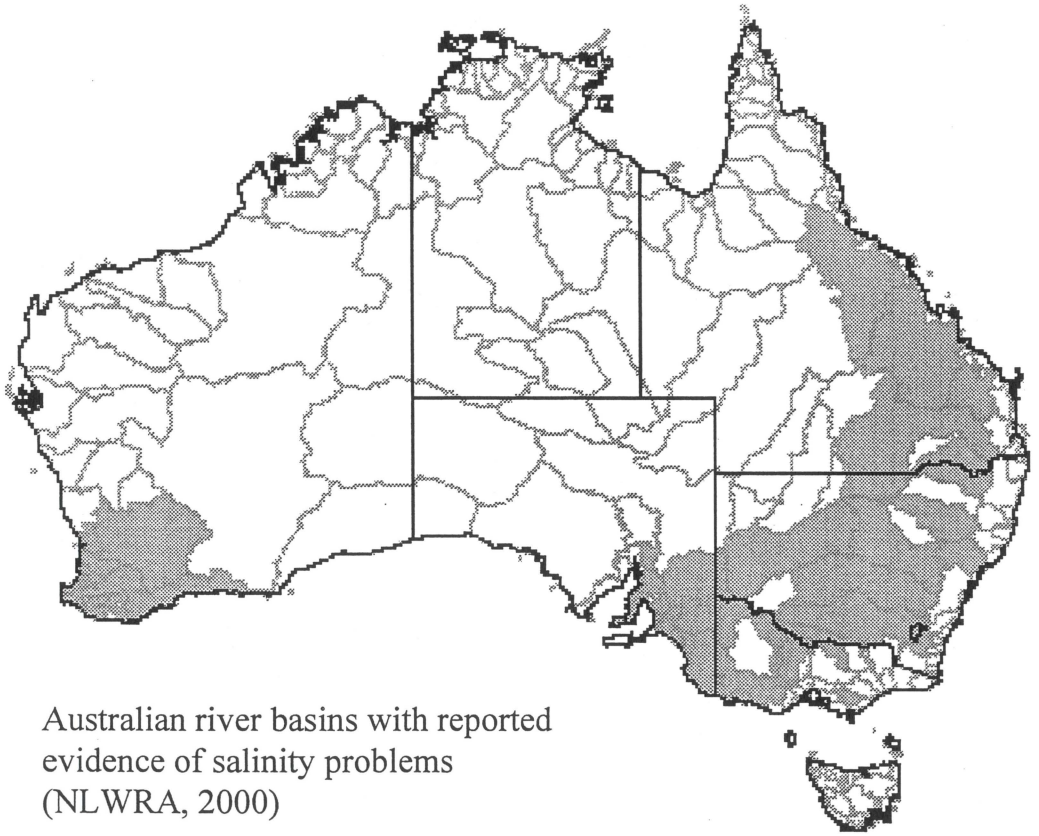
Dryland Salinity





DRAINAGE FROM LANDSCAPE
1 to 10 mm/year

LEAKAGE INTO LANDSCAPE FROM BENEATH ANNUAL CROPPING
15 to 150 mm/year

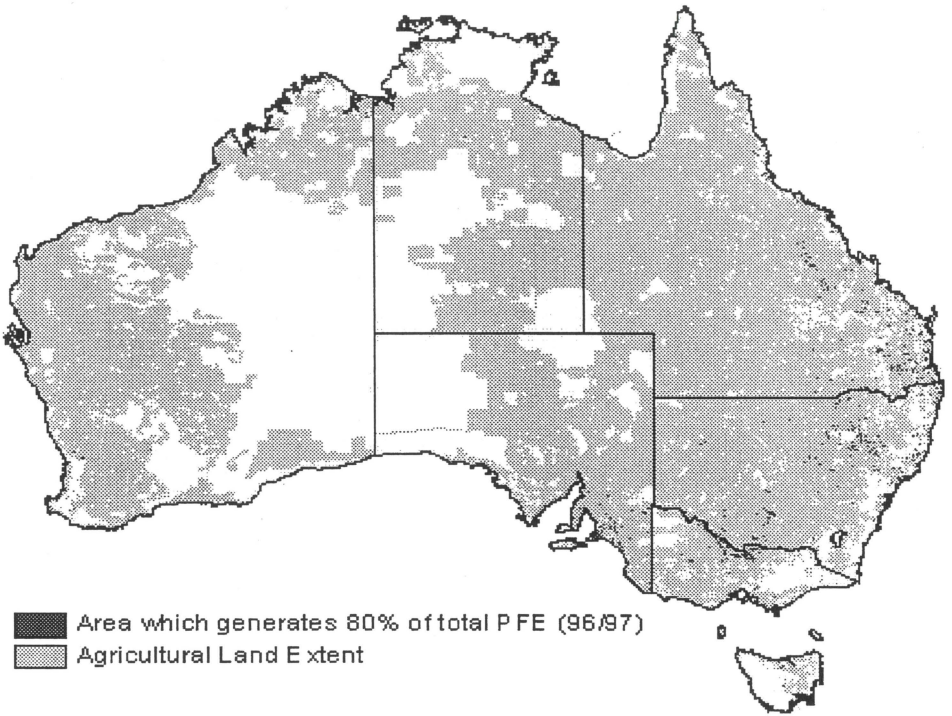


Australian river basins with reported evidence of salinity problems (NLWRA, 2000)

Profitability

Currently profitability of broadscale agriculture is low, I.e., 80% of profit comes from 0.4% of ag-land and rangeland.

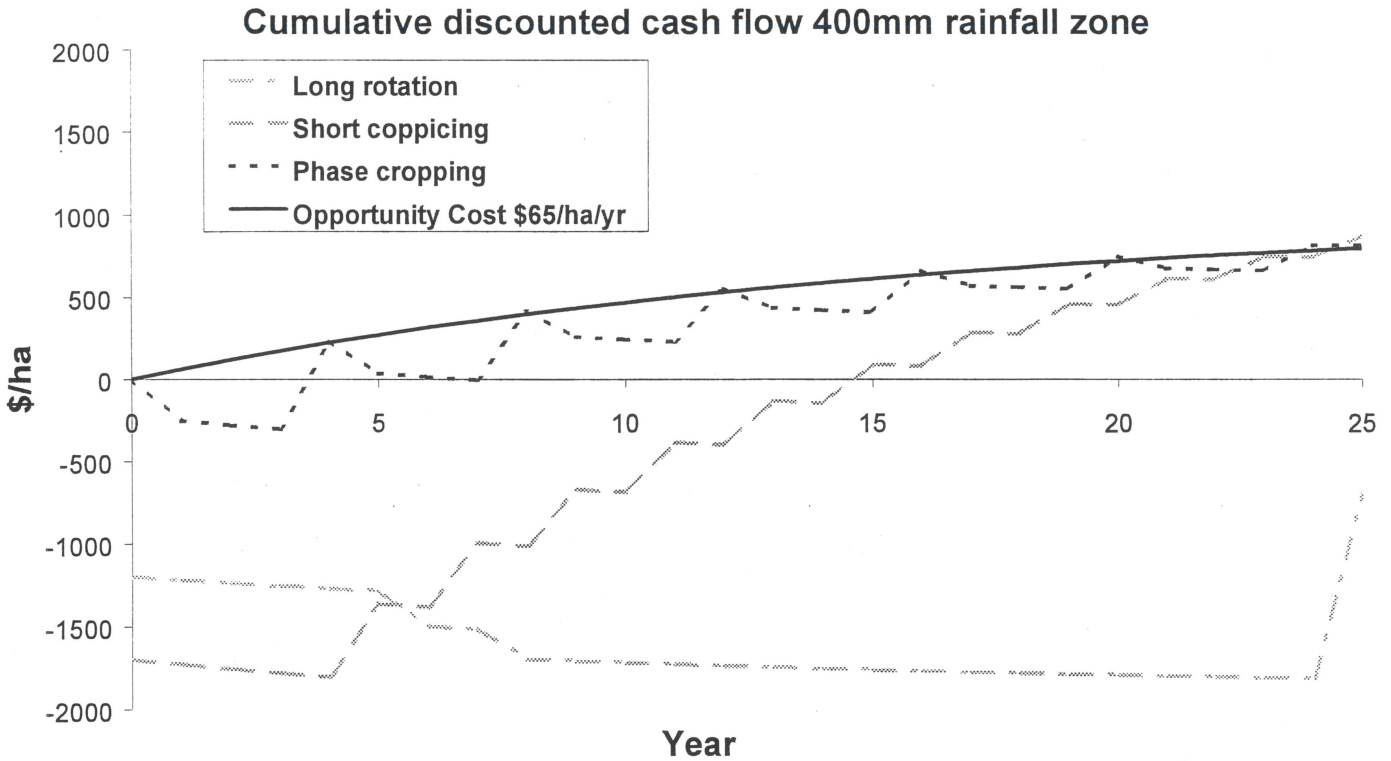
NLWRA, 2002




TOYOTA

Potential woody biomass production

Revegetation %	Area (Mha)	Annual green yield (Mt)	Annual dry yield (Mt)	Annual dry wood yield (Mt)
20%	12	180	90	36
30%	18	270	135	54
40%	24	360	180	72


Cumulative discounted cash flow 400mm rainfall zone
Long rotation
Short coppicing
Phase cropping
Opportunity Cost $65/ha/yr
2000
1500
1000
500
0
-500
-1000
-1500
-2000
$/ha
0
5
10
15
20
25
Year

Product options

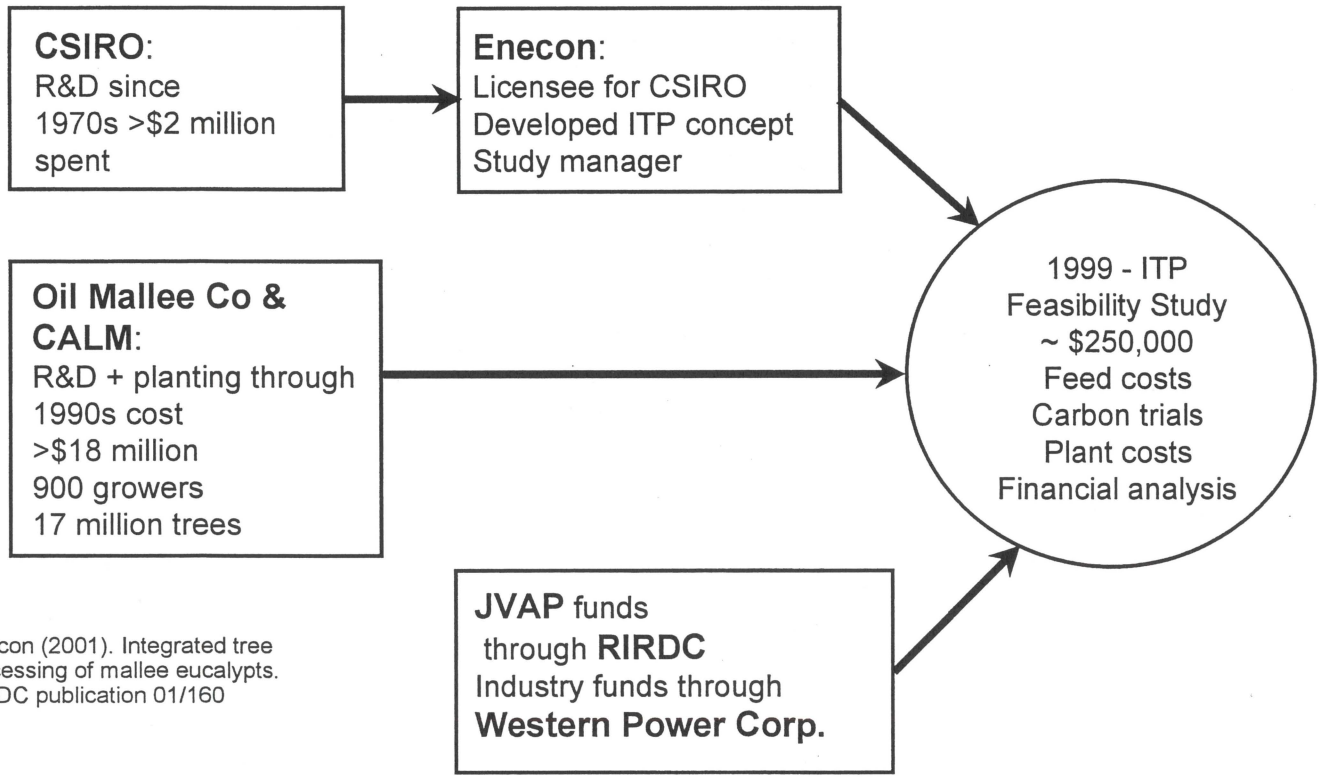
Product group	Product type	Market size
Grazing	Meat	Large
	Wool	Large
	Manufactured feeds	Medium
Wood	Sawn wood (specialty, construction)	Large
	Panels (particle, MDF, OSB, composites)	Large
	Processed wood (pulp/paper, charcoal)	Large
Bioenergy	Electricity (+ industrial heat, desalination)	Large
	Transport fuel (alcohols, biodiesel)	Large
Chemicals	Extracts: oils, gums, tannins, resins	Large
	Derived: pyrolytic liquids	Medium
Food and flowers	Staple food	Large
	Bush tucker	Tiny
	Ingredients	Small
	Flowers	Tiny

Size ratings: Large >1 M ha, medium 100 000 - 1 M ha, small <100 000 ha.

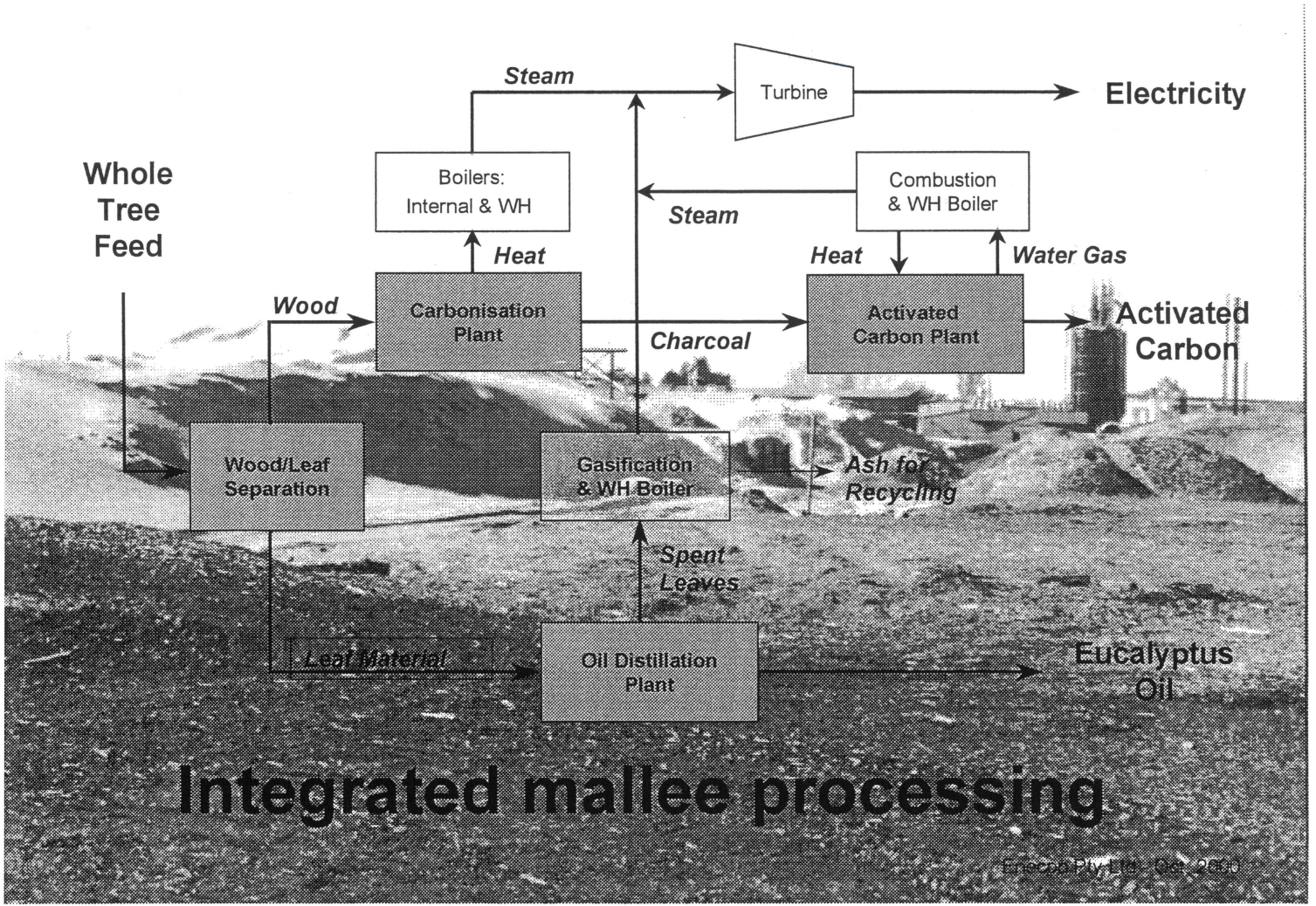
Product prospects ~ 2020

Product group	Product prospects	~Area
Grazing	Historically over supplied. Preference for herbaceous perennials	1 M ha
Wood	Sawn wood only competitive in wetter 20% New SRCs produce competitive feedstocks Rapid market expansion for panels Depletion of tropical forests Greenhouse conventions increase market share	1 M ha 4 M ha
Bioenergy	Greenhouse conventions increase renewables share Declining reserves of low cost petroleum. Rapid technology development in alcohols Consumes low value fractions of SRCs	5 M ha
Chemicals	Extracts are low cost co-products Bioenergy technology makes chemicals viable	1 M ha
Food & flowers	Negative terms of trade, dominated by the 'big 12' Tighter regulation of new food crops	0.1 M ha

Integrated mallee processing feasibility study



Enecon (2001). Integrated tree processing of mallee eucalypts. RIRDC publication 01/160

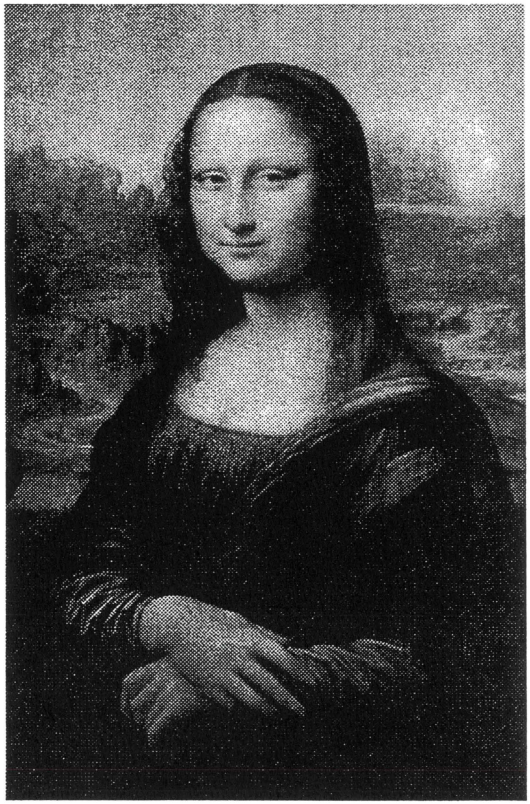

Steam
Turbine
Electricity
Whole Tree Feed
Boilers: Internal & WH
Combustion & WH Boiler
Steam
Heat
Heat
Water Gas
Wood
Carbonisation Plant
Charcoal
Activated Carbon Plant
Activated Carbon
Wood/Leaf Separation
Gasification & WH Boiler
Ash for Recycling
Spent Leaves
Leaf Material
Oil Distillation Plant
Eucalyptus Oil
Integrated mallee processing

Capital Requirements to the Year 2050

- 1000 * methanol/electricity plants at $100 m each = $100 bn
- Establish 30 million ha of biomass plantation @ $2000/ha plus $1000/ha inputs over first five years = $90 billion
- Total = $200bn or $4bn per year

Enough-ness!

- Will increasing per capita consumption (forever) lead to a better life of all Australians
- How do we deal effectively with the increasing polarisation of the 'haves' and 'have nots' without burning the floorboards to keep our toes warm
- Can we reconnect urban and rural Australia in ways that are mutually advantageous
- Could we make the gradual transition from the consumption-driven to an investment-driven economy
- Can we find a productive place at home for a $600 billion (and growing) pool of our own superannuation funds (and make the place better at the same time)



Mona Lisa Investment Vehicles

- Act as large sinks for capital
- Slows down (or does not stimulate) fossil energy consumption in medium–long term
- Wide range of crosscutting effects
- Capital growth not yearly returns
- Cascade of social positives
- Generate new export opportunities

Leveraging The Future

- Understanding the essential linkages between consumption, affluence, economic growth, energy and carbon
- Designing regional responses to energy self sufficiency, carbon neutrality and industry renewal
- The 'biomass economy' and investing positively in landscape renewal
- New investment vehicles for Australian superannuation funds
- Searching for the new Adam Smith, and a new economic paradigm with a 'visible hand'