

# Victorian Food Supply Scenarios: Impacts on Availability of a Nutritious Diet

A selection of scenarios to  
stimulate thinking . .

Part 2: Australia

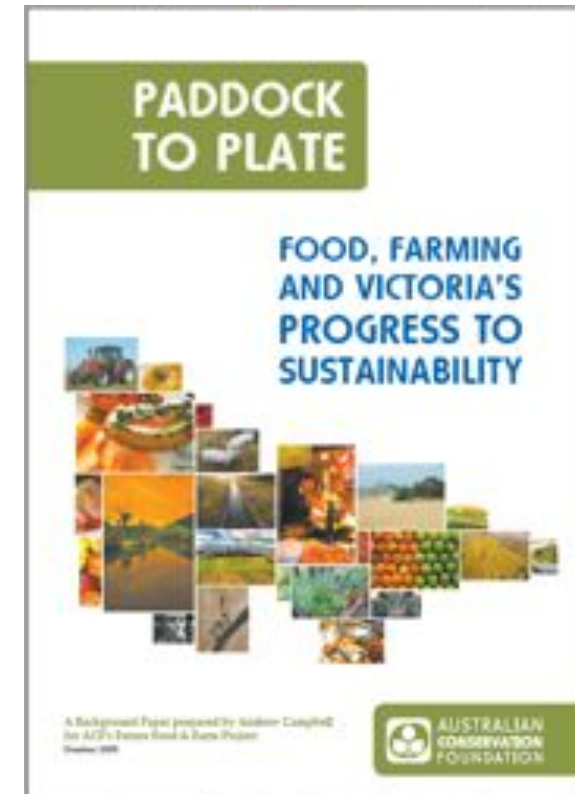


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# Australia

# Paddock to Plate: Possible Agricultural Futures

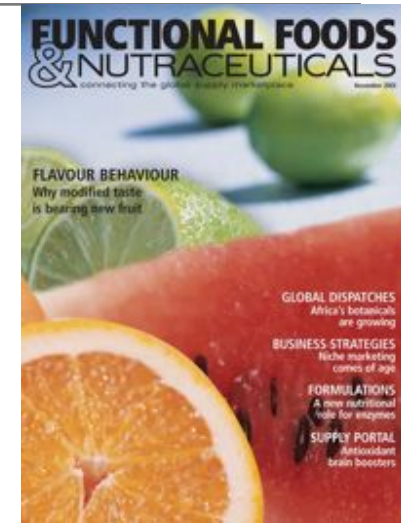
- » As part of the *Paddock to Plate: Food, Farming and Victoria's Progress to Sustainability* project, snapshots of four potential trajectories for Victorian agriculture and food production were prepared.
- » The variables that are mixed in different ways in each scenario include the type and application of new technologies, the prevailing policy and institutional framework at local and national levels, the extent of engagement with world markets, the regional social and economic context, and finally prevailing community attitudes and norms.
- » The shorthand names for these scenarios are Corporate HiTech; Landscape Stewardship; Back to Earth; and Farming like an Australian.



- » *These scenarios may imply a coherence and internal consistency that in reality is unlikely to be realised. Different farm businesses are likely to combine different elements of these scenarios in combinations quite different from those suggested here, and the spatial distribution of these across a given region, the state or the continent as a whole is likely to be complex. New technologies that improve resource use efficiency and profitability might be adopted under any of these scenarios, and some of the institutional responses to environmental issues are likely to affect all of them. The use of scenarios in this way is an heuristic device, to enrich the discussion, not a forecasting device (Campbell 2008)*

# Corporate HiTech

- » Large scale, vertically integrated operations
- » Generic commodities, functional foods and nutraceuticals targeting world markets.
- » GM cultivars
- » Tight specifications and traceability along the production chain
- » Automation: satellites and telemetry to precisely monitor, map and meter inputs and outputs;
- » Very high input efficiency
- » The whole landscape is managed for environmental services, including bioenergy from waste streams, but only profitable soils are farmed.
- » Fine resolution climate models over short-term, seasonal, annual and decadal cycles.
- » Financial institutions make extensive use of such models and require borrowers to hedge against climate risk.



# Landscape Stewardship

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- » This scenario no longer conflates 'rural' with 'agricultural'. "Corporate hi tech" trends are **complemented by a trend towards diversification and extensification**, where rural landscapes are valued as arenas of consumption (of landscapes, lifestyles and non-urban experiences) as well as engines of food, fibre and clean energy production.
- » **CMA's purchase environmental services** from all landholders within the catchment, with payment applying only to that portion of the service that is over and above a clearly articulated duty of care not to degrade the resource base.
- » **Water prices are never less than the full cost of supply** (including a loading for restoration of historical damage and externalities), but in effect competition for the scarce resource will keep water prices way above this statutory floor. Irrigators trade actively in water futures.
- » All **rural subdivisions have body corporate structures** accredited by the catchment board to manage water supplies, driveways, underground services, reticulated waste water, fire protection and pest and weed management consistent with the catchment plan.
- » The **distinction between hobby farmers and other farmers dissolves** as few landholders have an exclusively agricultural income. The majority of farm income is derived off-farm, usually in one of the myriad service industries that have emerged to support rapidly growing regional populations and corporate farms.
- » The **environment industries are already bigger than any of the primary industries other than mining**. Add in tourism, and non-agricultural products from rural landscapes already exceed agricultural outputs by value.



# Back to Earth

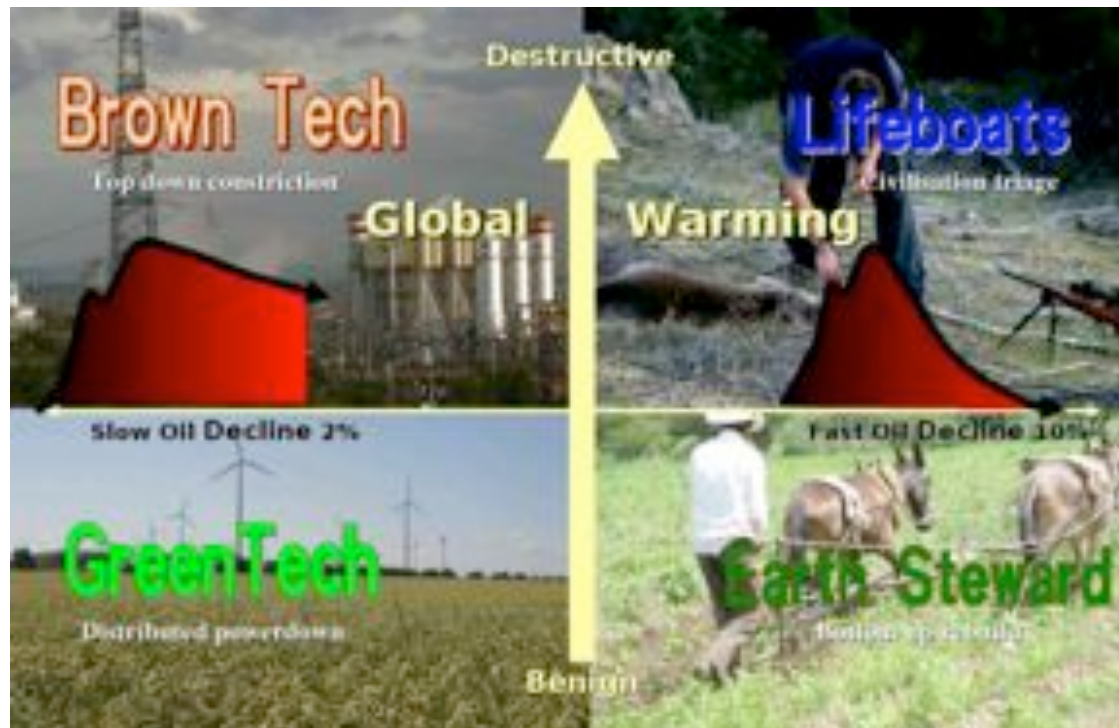
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- » Consumer distrust of industrial agriculture is leading many consumers in OECD countries to want direct contact with their food production.
- » Biological agriculture in its various forms — organic, biodynamic, permaculture — has a significant market share of rusted-on consumers and a rapidly growing share of the total market.
- » Farmers' markets; city farming on rooftops, balconies and urban wastelands; and community gardens give people direct engagement with and confidence in how their food is produced.
- » Many communities on the eastern seaboard of Australia approach self-sufficiency with a wide range of locally produced foods.
- » Supermarkets play a key role by ensuring high profile branding of the products from these systems and strict segregation from the GM products of the Corporate Hi Tech scenario.
- » This scenario is likely to blend with the one above, with both integrated into regional tourism and regional niche marketing.



# Holmgren (2008): Future Scenarios for Energy Descent

- » The simultaneous onset of climate change and the peaking of global oil supply represent unprecedented challenges for human civilisation
- » Global oil peak has the potential to shake if not destroy the foundations of global industrial economy and culture. Climate change has the potential to rearrange the biosphere more radically than the last ice age. Each limits the effective options for responses to the other



# Brown Tech: Top Down Constriction

## Summary

- » The Brown Tech world is one in which the production of oil declines after a peak 2005-2010 at about 2% per annum and the subsequent peak and decline of natural gas is also relatively gentle, but the severity of global warming symptoms is at the extreme end of current mainstream scientific predictions.
- » “Top down constriction” summaries the essence of this scenario in that national power constricts consumption and focuses resources to maintain the nation state, in the face of deteriorating climate and reduced energy and food supply



## Implications for Food

- » The wealth of farmers and miners as well as corporations and nations in control of these resources increases even as depletion reduces the flows of resources and climate change causes chaos in farming and land management.
- » The demand for biofuels in affluent countries reduces world food stocks and raises prices to levels that result in famine and chaos in many poor countries unable to sustain subsidies for staple food.
- » Wars to secure fuel and food increase and refocus public attention on external threats. In richer countries, consumer led economic growth falters or is actively shut down by government policies to focus limited resources on food, fuel and climate security.

<http://www.futurescenarios.org/content/view/28/48/>



# Green Tech: Distributed Powerdown

## Summary

- » The Green Tech scenario is the most benign, in that adverse climate changes are at the low end of projections. Oil and gas production declines slowly as in the Brown Tech future, so the sense of chaos and crisis is more muted without major economic collapse or conflict. This allows resources to flow to a greater diversity of responses at the global, national, city, community and personal level.



## Implications for Food

- » The relatively benign climate allows a resurgence of rural and regional economies on the back of sustained and growing prices for all natural commodities including feedstocks for biofuels.
- » The principles behind organic agriculture and ecological management and resource allocation become the norm in many farming systems, helping to stabilise agriculture challenged by increasing cost of energy inputs and (albeit mild) climate change.
- » In many regions with prime agricultural land and small populations, wealthy farmers and agribusiness corporations are the main beneficiaries employing both high technology and cheap labour from migrant workers. In some regions, smaller scale polyculture systems designed using permaculture principles spread wealth more evenly through local communities.
- » Regional cities, towns and villages see modest growth on a compact urban model that preserves prime agricultural land and develops mixed use neighbourhoods with more local work and radically less commuting.

<http://www.futurescenarios.org/content/view/29/49/>

# Earth Steward: Bottom Up Rebuild

## Summary

- » In this scenario the decline in oil production after a peak in total liquids production before 2010 is at the extreme end of authoritative predictions (about 10%) and is followed by an even faster decline in gas production plus a simultaneous peak in coal production. The shock to the world's fragile financial systems is overwhelming, resulting in severe economic depression and perhaps some further short, sharp resource wars.



## Implications for Food

- » There is a radical reduction in mass mobility of both people and goods. The food supply chain is severely affected both on farms and through the distribution system. Energy intensive large scale farming supplying central marketing chains is the worst affected leading to abandonment of even highly productive land. Shortages lead to rationing, black markets, and riots for food and energy.
- » Loss of jobs and houses leads to migration of people out of cities to smaller towns, villages and farms with more robust local economies able to take advantage of the influx of labour. Impacts and demands on local soil, water and forest resources increase.
- » Organic and small farmers, close to markets and able to make use of labour and animal power, thrive (to the extent security allows) in a context of relatively benign and slow climate change.
- » Ruralisation of suburban landscape to produce food on all available open space, private and public provides most of the fresh fruit and vegetables, dairy and small livestock products..

<http://www.futurescenarios.org/content/view/30/50/>

# Lifeboats: Civilisation Triage

## Summary

- » Supplies of high quality fossil fuels decline rapidly, the economy fails and human contributions to global warming collapse but lag effects and positive feedbacks in the climate system continue to drive an acceleration of global warming.
- » Successive waves of famine and disease breakdown social and economic capacity on a larger scale than the Black Death in medieval Europe leading to a halving of global population in a few decades.
- » “Civilisation triage” refers to the processes by which remaining social capacity (beyond meeting immediate basic needs) are focused on conserving technology and culture that could be useful to a future society, once energy descent is stabilised after a precipitous but limited collapse process.

## Implications for Food

- » New forms of oasis agriculture that are low input versions of the Brown Tech intensive systems evolve that stabilise food production as chaotic seasons make traditional field agriculture and horticulture almost impossible. Forest and rangeland hunting and harvesting become the predominant use of resources over large regions supporting nomadic bands.



<http://www.futurescenarios.org/content/view/31/51/>

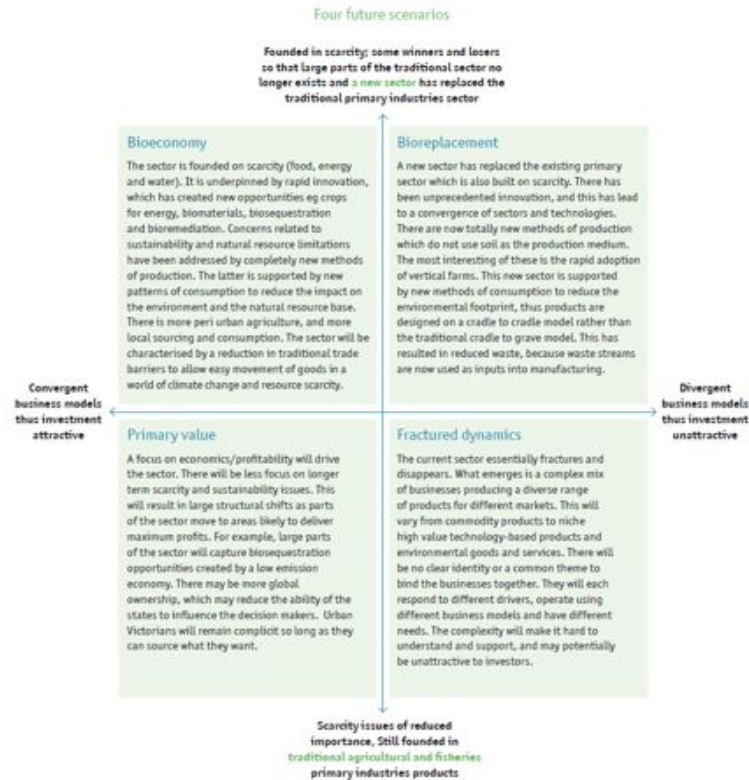
# DPI Victoria: 20 Year Strategy Project

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- » The scenarios were based on outputs from the Agricultural and Fisheries Foresighting and Vision Workshop convened by DPI. The workshop included representatives from the agriculture, forestry and fisheries industries and government sectors
- » DPI utilised a scenario planning methodology in the workshop. Such methodologies recognise that the future is uncertain and cannot be predicted. Instead of forecasting only one version of how things might evolve, scenario planning paints several different pictures. Common elements to the scenarios are then highlighted and considered in future strategic planning processes. Four possible scenarios were developed by an external consultant based on the discussions of the external participants at the workshop.
- » *No attempt was made by DPI to validate the scenarios or the outputs from the external participants. None of the four scenarios are exclusive of the others or certain to occur. It is more likely that only certain elements within each scenario may play out at the same time but at different rates.*
- » These scenarios are used to illustrate the tensions between:
  - ... the traditional view of primary production and a possible post primary production future (vertical axis), and
  - ... the convergence / divergence of industry boundaries (horizontal axis)

# DPI Victoria: 20 Year Strategy Project

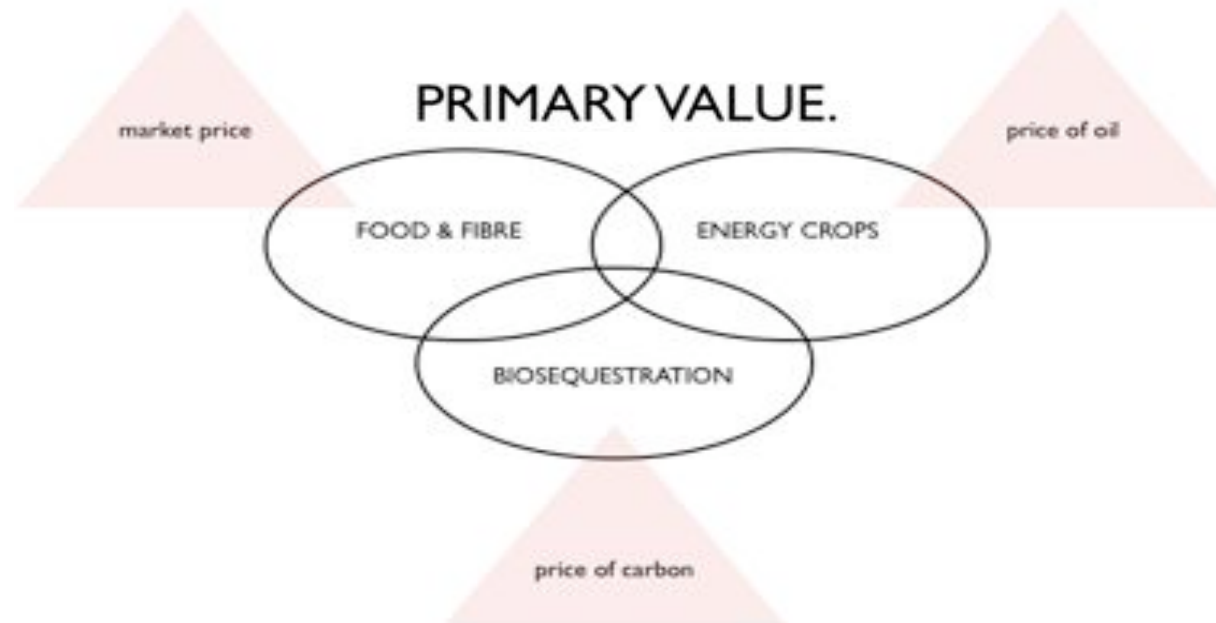
- » The convergence or dissolving of industry boundaries is similar to that occurring between food and energy sectors. The 'divergence' explores the fragmentation that could occur when parts of the sector move into tourism, parts into high niche products and the rest is left in bulk commodities.



# Primary Value

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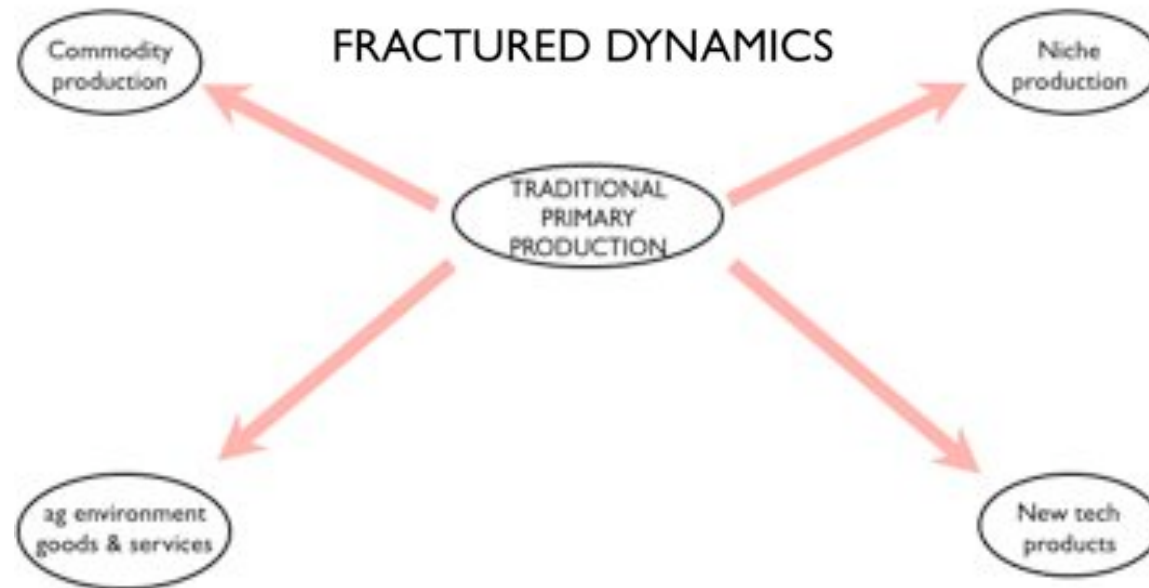
- » A focus on economics / profitability will drive the sector, less focus on longer term scarcity and sustainability issues
- » Large structural shifts as parts of the sector move to maximum short-term profit eg. bio-sequestration opportunities of low carbon economy
- » Key decision making moved away from the state and into private market – particularly through global ownership
- » Urban Victorians are complicit as long as they can source what they want



# Fractured Dynamics

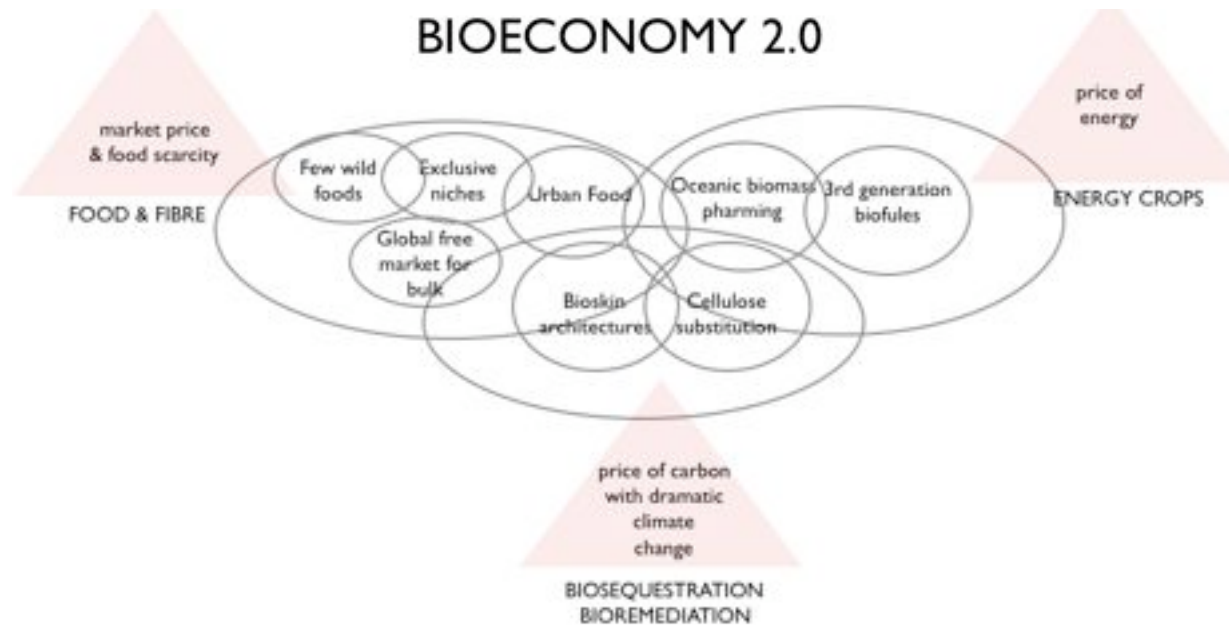
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- » Current sector essentially fractures and disappears
- » A complex mix of businesses emerge producing diverse products for different markets – ranging from commodities to niche high value technology-based products and environmental goods and services
- » No clear identity or common theme to bind the businesses together
- » They will each respond to different drivers, operate using different business models and have different needs
- » The complexity will make it hard to understand and support, and may potentially be unattractive to investors



# Bioeconomy 2.0

- » Sector is founded on scarcity (food, energy and water). It is underpinned by rapid innovation, which has created new opportunities eg. crops for energy, biomaterials, biosequestration and bioremediation
- » Concerns about sustainability and natural resource limitations have been addressed by completely new methods of production
- » These are in turn supported by new patterns of consumption to reduce environmental impact
- » There is more peri-urban agriculture, and more local sourcing and consumption
- » The sector will be characterised by a reduction in traditional trade barriers to allow easy movement of goods in a world of climate change and resource scarcity

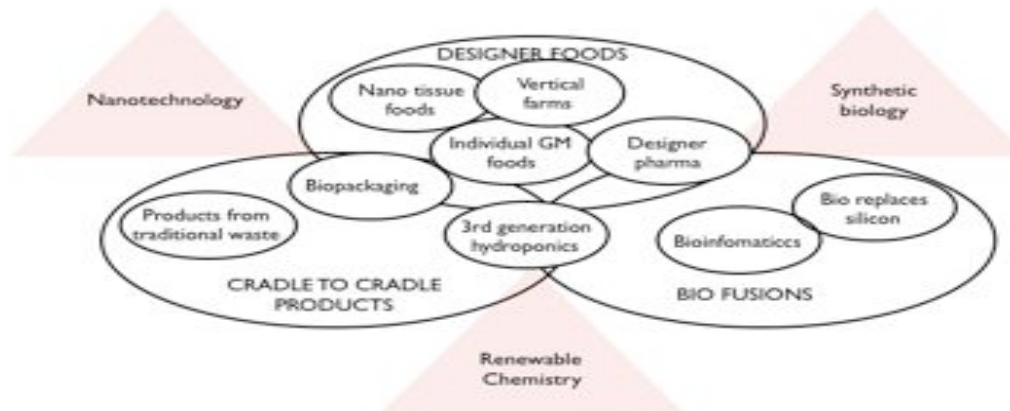




# Bioreplacement

- » A new sector, also based on scarcity, has emerged
- » There has been unprecedented innovation which has led to a convergence of sectors and technologies
- » There are now totally new methods of production which do not use soil, including rapid adoption of vertical farms
- » This new sector is supported by new consumption to reduce the environmental footprint, thus products are designed on a cradle to cradle model
- » This has resulted in reduced waste, because waste streams are now used as inputs to manufacturing

## BIOREPLACEMENT



## DPI – Scenarios for Agriculture in the South West

- » Contextual scenarios deal with those factors which are outside an actor’s control, but which strongly influence the environment within which the actor may have to operate. By exposing the rationale to consideration and criticism, our aim is to develop different, challenging, contextual scenarios which provide insights into the current global trends and future uncertainties which are likely to impact on Victorian agriculture in the coming decades.
- » The DPI VCCAP scenarios are centred around 3 of the series of climate projections developed by the Intergovernmental Panel on Climate Change (IPCC).

Special Report on Emission Scenarios (SRES) scenario title	Key assumptions
A1FI: A ‘worst case’ climate projection based on high global economic growth and fossil fuel use	High global economic growth rates Population growth which peaks mid-century (2050) and declines High levels of global co-operation and living standards (convergence) Energy requirements principally derived from fossil fuel sources Increasingly efficient technology.
A2: A divided world rather than a co-operative world, where the focus is on implications for trade as well as a gradually worsening climate	Regional rather than globally co-operative growth (heterogeneous world) Economic and population growth rates slower than the A1 family Energy requirements derived from a mix of energy sources.
B1: A ‘best case’ climate projection based on a major global shift to renewable energy, and the opportunity which this creates for multi-purpose use of agricultural land	Economic, population growth and co-operation levels as for A1FI Focus on global solutions to economic, social and environmental sustainability Rapid changes toward a service / information economy Introduction of clean, resource efficient technologies.

- » All futures portrayed in the SRES scenarios assume continued, generally strong, global economic growth. No SRES scenarios consider a future under low global economic growth.

# DPI SW Scenarios: A1F1

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- » Recent observations indicate that the growth rate in emissions of CO<sub>2</sub> since 2000 is already higher than that assumed in A1FI, that temperature and sea level rise are already tracking above the A1FI projection, and that the SRES projections are too conservative.
- » An outline of the A1F1 scenario is included here. A document with detail on each of the three scenarios is also attached (DPI SW Scenarios)
- » Characteristics: Upper bound of the A1FI emissions scenario. High levels of global co-operation. China and India strong. World continues to rely heavily on energy from fossil-fuels. Climate is severe and gets worse quickly.

## 2010-2030

- » Rainfall in SE Australia is becoming increasingly erratic. Sometimes we get little or no rain for a few years. Then we get a burst in summer followed by nothing. Agriculture becomes opportunistic. The overall reduction in rainfall produces significantly lower crop yields. Extreme storms produce major losses in what is left. GM advances are not effective early in this period and farmers struggle to adapt. *Climate change seems to happening faster than we thought it would.* Household stress in farming families increases significantly.
- » Reduced water availability also brings significant change in government and community attitudes. The Federal Government takes over responsibility for water management. Water availability is heavily regulated. Farmers have to monitor their water use and pay a high price for every drop. Irrigated dairy in northern Victoria disappears. Weakened stock and crops are plagued by anthrax, locusts and other pests and diseases. This produces food safety concerns in our export markets.

# A1F1 2010-2030 cont.

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- » Temperature is increasing at or above the upper envelope of the IPCC projections. Historical records for the number of days above 35°C are exceeded almost every year. Intense bushfires are frequent in Victoria. Fuel loads eventually become depleted through burning and limited regrowth. *Smoke haze becomes a regular feature of the skyline.* Asthma becomes a real problem. Scientists are warning of a breakdown in fundamental ecosystem services. Climate refugees appear in increasing numbers.
- » In the latter half of this period, parts of Canada and the Ukraine experience enhanced growing seasons. Global wheat production levels escalate and the price falls dramatically.
- » Toward the end of the period, advances in GM technology result in the development of perennial wheat. However, because this coincides with climate enhanced growth of wheat in Canada, farmers struggle to make the investment. Technology uptake and benefits are highly non-uniform. GM improvements in animals provide high protein, low cholesterol meat. *The resurgence of the mining industry means that getting labour in agricultural regions is like getting a plumber - \$100/hr or I don't come.* The uneven impact of climate change on commodity prices means that only some sectors can pay these wages.
- » In the business world, China and India have weathered the global economic downturn. They continue to grow, but at a moderate rate (6%-9%). Confidence in Wall St is re-established. The inter-governmental planning required deal with the financial crisis results in high levels of global co-operation. The global focus is to re-establish growth. 'We will spend our way out of this recession'. 'We will use technology in smarter ways'. 'We will introduce new safeguards'. *China's growth sends the \$A to the high US\$0.70's as demand for coal and iron-ore starts to rise again.*
- » Coal continues to be the primary source for electrical energy. The pilot program for *carbon sequestration* is successful. It proves that we can use technology to manage CO<sub>2</sub>. *The carbon price starts at \$20/tonne and is rising.* OPEC ensures that oil prices climb to painful levels as the global economy gets back on its feet. Coal to oil becomes profitable. Fertiliser costs are becoming prohibitively high. Alternative supply strategies are being sought.
- » Climate has created a 'new poor' in other regions as people try to sell, but find their property value significantly diminished. Concern for the environment is replaced with concern for self in these harsh conditions. The pressure of dealing with change causes townspeople to increasingly withdraw into a world of air-conditioned comfort and distractions. Sales of computer games on holographic TV's are on the rise.

# A1F1 2030-2050.

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- » Rainfall in south eastern Australia is now highly erratic. Total rainfall appears to have stepped downwards dramatically, similar to that observed in SW WA in the 1970's. Extreme storms are now common and widespread. All attempts at current farming practices seem to fail. Input costs have reached the ridiculous level. Nauru has disappeared. We now get phosphates by harvesting our wastes. Temperature has become almost unbearable in some regions. Southern Europe starts to resemble a scorched earth.
- » China's growth has led to it becoming the leader of the global economy. The \$A is strong. Many currencies are now valued relative to the Yuan. World economies are forced to spend more on their energy budget, their ageing populations, refugee management and on increasingly frequent natural disasters.
- » Oil reserves are holding but depleted. Prices are very high. Coal is still used to generate electricity and to produce oil. Oil shales and poor quality coal seams are now being harvested. China is buying into uranium companies in Canada. Transport solutions based around hydrogen and electricity are being developed. Resource supply tensions have flared but international agreements to ensure sharing of energy resources have been maintained for the sake of global growth.
- » Significant sea level rise has occurred. *One hundred million climate refugees are on the move.* The search for food and the need to escape flooding overwhelms the resources of southern EU countries and India. Global tensions produced by the need to take refugees, maintain border security and continue trade relations, start to emerge. Australia is hit by a tide of boat people from the Pacific and SE Asian regions. *How do we resettle 2 million new people in 3 years?* The government strategy is to send them to the regions.
- » Improved growing seasons in Canada, Russia and Brazil produced by climate change, and the developments in GM foods have comfortably met global food needs for a long time. But around 2040 the temperature increase and high winds produce unexpected problems. Insect plagues and mites not seen before appear in cereals and tree crops. Monocultures do not seem to be able to resist these new diseases. Genetic diversity has been lost. The Three Gorges Dam has cut sediment movement into the East China Sea. Fishing is devastated.
- » In Australia, the on-going dry spell results in tree deaths by the millions. Biodiversity is severely compromised. Moves toward synthetic food production at a global level appear promising, but the death of thousands in Asia as unscrupulous traders seek to exploit the crisis for profit creates food panic. A number of countries are having difficulty producing sufficient food for internal consumption. We can't go on like this.

## Irrigation Futures of the Goulburn Broken Catchment (2006-07)

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***NB: Explanation and commentary are taken from Campbell (2008)***

- » Irrigation Futures was a collaboration between a range of regional, state and national organisations, managed by **DPI Victoria** and the **CRC for Irrigation Futures**, which explored the future of irrigated agriculture in the Goulburn Broken region
- » The Goulburn Broken Catchment is probably Australia's best-known food bowl, with brands like Ardmona, SPC and Devondale closely associated with the region. It covers 2.4 million hectares and has a population of around 200,000 people. Irrigated agriculture is a major business engine in the region, producing more than \$1.6 billion at the farm gate in 2004-05 from about 280,000 hectares of irrigated agricultural land. Investment in on-farm and processing infrastructure is about \$100 million per year (Young 2001). This region, largely on the back of irrigation, is a major contributor to the state and national economy.

## Irrigation Futures (cont.)

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- » **Moving On** envisages a continually drying climate, many rural towns are in terminal decline and radical increases in water prices as the privatised water companies seek to reinvest in infrastructure and to provide a decent return to their investors. Many irrigators leave the industry, but those remaining are efficient and make good use of new technologies while minimising environmental impacts.
- » **New Frontiers** sees the region, to use Neil Barr's (2005) model, transition from an agricultural production landscape to an amenity landscape, with a much higher proportion of lifestyle landholders and widespread telecommuting. These newcomers are politically powerful and their lifestyle preferences see increasing environmental regulation and use of water for environmental flows.
- » **Pendulum** sees Green parties with the balance of power at state and federal levels in the 2005-20 period, and ratification of the Kyoto Protocol and other international agreements leading to trade in carbon and other environmental services. After 2020, a conservative federal government, concerned with reinvigorating regional economies, assumes control over water and reallocates water from the environmental reserve, auctioning entitlements on the open market. With a return to wetter conditions, agriculture within the region goes through a renaissance, ecosystems recover and the region regains prosperity.
- » **Drying Up** envisages a major recession in the USA during the 2005-12 period, causing the US dollar to drop and making US agricultural products increasingly competitive, encroaching on traditional Australian markets. Horticultural industries focus on high quality fresh fruit for the domestic market, while the dairy industry attempts to capitalise on markets for value-added products, such as nutraceuticals. Post-2020, the global economy recovers, many Asian and South American countries become more affluent, and the World Trade Organisation (WTO) removes agricultural subsidies. International and domestic consumers increasingly demand food with credence values, particularly those offering health benefits and GM-free.

## Irrigation Futures (cont.)

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### **NB: Commentary from Campbell (2008), p86**

- » *It is interesting that — in three out of four of their scenarios — the 120 interested community, industry and agency representatives in the Goulburn Broken region in 2006-7 envisaged a return to wetter conditions (and higher water use) after an initial extended drought. Only in New Frontiers is the drying trend of the 2005-20 period sustained. Whether this reflects wishful thinking, or a belief that the current story is one of decadal variability rather than a permanent step-shift in climate, it was inconsistent with the weight of scientific opinion then, and certainly is now (I think it may have been Mark Twain who said “de Nile aint just a river in Egypt...”). Again, the impact of rising energy prices is not given much weight and the prospect of markets for carbon is also barely mentioned. The key branching points, to use the BCA term, include the operation of world markets, the attitude of consumers (and governments) to genetically modified foods, the degree of investment in infrastructure and the way which water is allocated. Some events envisaged well into the future — the federal government takeover of water, importing guest workers to pick fruit and the removal of the barrages at the bottom of the system — have either occurred already or seem imminent.*
- » *In their introduction, Robertson et al (2007) make the critical point that these scenarios highlight the enormous range of possible development trajectories for the Goulburn Broken region, with some marked differences in the demands on the irrigation system and hence its infrastructure. They note that this has big implications for the way in which the necessary refurbishment and modernisation of the region’s irrigation infrastructure is carried out, and suggest that flexibility should be a key design criterion in developing any new system, so that components of the system can be closed down if necessary, or their introduction delayed according to demand and water availability.*