Global Challenges, National Opportunities

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Today’s Recipe

• Global Challenges, National Opportunities
• National Strategy and Progress
• CSIRO alignment to National Strategy
• The Social Side of Technology
Megashock: Food Security

Global Food Demand (Petacal/day)

Year

Estimated total food production demand of 730 Exacal over the 2010–2060 period

Estimated total food production demand of 677 Exacal over the 1500–2010 period

Source: Brian Keating, CSIRO
Australians expenditure on health not sustainable

*Health and aged care costs to rise from $84 billion in 2003 to $246 billion in 2033*

- Ageing population
- Obesity increasing
- Increased chronic disease

*One-third of chronic disease and injury in Australia is attributable to diet and lifestyle related risk factors.*
Megashock: Food Safety & Biosecurity

In Australia
- 5.4 million cases food poisoning per annum,
- 17,770 hospitalizations
- 125 deaths
- $1.2 billion lost in productivity per year.
- Food imports top $9bn
Looking back: 1961-2000

- Population rose 98%
- Food production rose 146%
- Per capita food production rose 24%
- Yields more than doubled (x 2.3)
- Arable land in use rose only 8%
- Arable land per person fell from 0.45 to 0.25 ha

- Inputs rose many fold
  - x 7 N fertiliser
  - x 3 P fertiliser
  - x 2 irrigation water
Balancing food supply and demand

Reducing Demand

- Smart biofuel technologies and policies
- A balanced livestock component in diets
- Expanding land area for agriculture
- Expanding irrigation
- Expanding aquaculture
- Closing yield gaps in existing farming systems
- New more intensive farming systems

Filling Production Gap

- Advancing crop and livestock genetics beyond current potential
- Maintaining pest resistance and biosecurity / food safety
- Avoiding land and water degradation
- Climate change adaptation
- Climate change mitigation
- Reducing waste along the food chain
- Reducing overconsumption in human diets
- Reducing demand

Sustaining productive capacity

- Expanding land area for agriculture
- Expanding irrigation
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Convergence of major consumer trends... 

...ARE DRIVING INNOVATION

- CONVENIENCE
- INDULGENCE
- HEALTH
- ETHICAL

HEALTH WILL CONTINUE TO BE A DOMINANT TREND

FOOD SAFETY IS A GIVEN
Current situation for Enterprise Australia

- Mining investment peaked
- Agriculture commodities up & down
- International education & tourism recovering as Australian $ falls
- Housing recovery underway

Boom time is over....What next??
Food is Australia’s largest manufacturing sector
There are more people living in this circle than outside of it.

The map was created by Valerie Pieris, who shared it on Reddit last year. The Washington Post did the math here.
Australia: the delicatessen of Asia
### Middle Class Transformation:

**Over 1.5 billion middle class consumers from India and China alone by 2020**

<table>
<thead>
<tr>
<th>Income (Annual)</th>
<th>Russia²</th>
<th>Brazil²</th>
<th>China³</th>
<th>India³</th>
<th>Turkey²</th>
<th>South Africa³</th>
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</thead>
<tbody>
<tr>
<td>Above $100,000</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>2</td>
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<td>12</td>
<td>13</td>
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<td>313</td>
<td>81</td>
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<td>80</td>
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<td>4</td>
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<td>500</td>
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<td>60</td>
<td>85</td>
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<td>4</td>
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<tr>
<td>Below $1,000</td>
<td>2</td>
<td>2</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

**Total Middle Class:**
- Russia: 55 million
- Brazil: 140 million
- China: 949 million
- India: 390 million
- Turkey: 864 million
- South Africa: 85 million

**Total Population:**
- Russia: 141 million
- Brazil: 210 million
- China: 1,388 million
- India: 1,399 million
- Turkey: 85 million
- South Africa: 53 million

*Note: Numbers in Millions

²Income brackets in Total Household Income Terms
³Income brackets in Per Capita / Individual Income Terms

Source: NCASI, Brazil; TurkStat; CNIC; FGV; Frost & Sullivan Analysis

Source: Innovating to the Future, Frost and Sullivan
Export commodities dominate despite efforts to value add

Elaborately processed foodstuffs stay stubbornly low, around 1% of total exports.

Source: DAFF 2013
Our innovation track record is not good ....

Australia: 10, 81
New Zealand: 13, 66
Netherlands: 11, 12

Innovation Inputs, Innovation Output Efficiency
National Food and Nutrition Strategy

R&D Priorities

• Food, nutrition and health
• Food safety – integrity & traceability
• Resource efficiency – sustainability
• Future markets and competitiveness
• Technology translation & adoption
• Skills and training
Building a National Food Innovation Network

- Melbourne VIC: CSIRO / RMIT
- Adelaide, SA: Food SA / SARDI / CSIRO
- Perth, WA: DAF/CSIRO
- Sydney NSW: UWS/ANSTO/CSIRO
- Hobart, TAS: DSTO/UTAS/CSIRO
- Brisbane QLD: DAFF/UQ/CSIRO

Supported by Australian Government
Industry Growth Centres

• The Industry Innovation and Competitiveness Agenda released on 14 October 2014
• The initiative will establish a $63 million Industry Growth Project Fund
• Peter Schutz announced as the Chair for the

Food and Agribusiness Growth Centre
• National Food & Nutrition RD & TT Strategy with FIAL
• Target Innovation towards Asia-Pacific consumer insights
• Develop through-chain collaborative R&D relationships
• Position Werribee as National Food Innovation Hub
• Develop science base for food safety & market access
• Leverage food safety capability for extending shelf-life
Next generation ready to eat chilled meals

30 days, 8°C

Value Added food Products
For Asian Market
CSIRO through-chain example - Grains

Genetics
Value adding & productivity

Crop management

Food processing

Clinical substantiation

Consumer engagement & sensory

Epidemiology & mechanisms
Through chain Integration: Dairy
- new levers for improving milk quality and processing

Feed system

Rumen microbes

Milk structure and functionality

Animal biology

Structure and processing

Milk functionality

Products

Farm-Factory interface

DEPI farm focus; plants & animals systems biology, omics analysis

CSIRO post-farm focus; Structure, processing & products
nutrition & health

• Refocus on food, diet & lifestyle determinants of health
• Determine Asia-Pacific nutrition, dietary needs & opportunities
• Position SAHMRI clinic as regional hub for substantiation
• Leverage TWD brand for direct consumer engagement
• Develop science base for personalised nutrition
Clinical Nutrition Research Centre

- co-located in SA Health and Medical Research Institute
- Substantiation of health benefits of foods/supplements/diets
- Piloting of diet and lifestyle programs
Health Integration

Industry partnerships

Personalised Health

Clinical support

Total Wellbeing Diet Online

Health Substantiation

Nutrition Claims
bioproducts

- Bio-engineer renewable biomass for high value products
- Link bio-engineering to bio-processing for innovative bioproducts
- Commercialise bio-inspired materials and biosensor technology
- Develop national scale bio-refinery concept
Through chain integration: Grains - Plant-sourced Omega 3 DHA

**BIOPROCESSING TECHNOLOGIES**

**FISH STOCKS**
Genes for synthesis of Omega 3 LC-PUFA can be transferred to plants

**ALGAE OMEGA 3 SOURCE**

**OMEGA 3 CANOLA**

**FOOD SUPPLY**

**MICROENCAPSULATED FOOD PRODUCTS**
1 HA canola = 10,000 fish

A joint venture between CSIRO, GRDC and NuSeed
Separation Technology

1997
- R&D on chromatographic separation (CSEP) technology
- Export of whey protein isolate (WPI)
  - Capital investment >$15M
  - Export income >$50M

1999
- Export of bio-fraction

2000
- Export of Lactoferrin
- Development of CSEP technology to produce bio-active dairy hydrolysates

2003
- Development of CSEP technology to produce glycosaminoglycans

2004
- Patent - stimuli responsive ion exchange resin

2006
- RSEP* technology to produce galacto-oligosaccharides
- Development of CSEP technology to fractionate bovine plasma

2010
- Patent - stimuli responsive ion exchange resin

2011

2012

2013
- Forward osmosis

*Continuous liquid and solid separation and reaction units utilizing ion exchange resin reaction
Australia’s innovation catalyst

Strategy 2020
1 HA canola = 10,000 fish
HOW INGENUITY WILL FEED THE WORLD.
Acknowledgements

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