# Overview of the Australian Protected Cropping Industry

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Chairman – Protected Cropping Australia

# Australian Protected Cropping Industry

- Fastest growing food producing sector in Australia
- Valued at $1.3billion farm-gate value per annum
- Equivalent to 20% of total value of vegetable and flower production
- Combining all sectors (retail, service providers, research, etc), industry contributes around $1.8billion to the national economy
- Employs over 10,000 people throughout Australia
- Indirect employment multiplier (est. x 2) = 20,000+ jobs
- Industry expanding at 4 – 6% per annum

# Australian Protected Cropping Industry

- Current investment in greenhouse vegetable infrastructure is very conservatively valued at $975m (est. 1,300ha at $75/m2)
- Annual investment in new infrastructure valued at $187m over next 24months (est. 85ha @ $220/m2)
- Major domestic retailers sending strong market signals to increase consumption (est. 25% for tomatoes), to 50% in next 5 – 8 years
- Woolworths have doubled consumption of greenhouse capsicums every year since 2005

# Greenhouse Production Statistics (vegetables) - estimated

| State | Greenhouse Area (ha) | No of Growers |
|---|---|---|
| QLD | 30 | 80 |
| NSW | 500 | 680 |
| VIC | 200 | 200 |
| SA | 580 | 650 |
| WA | 21 | 30 |
| TAS | 10 | 25 |
| **Totals** | **1341** | **1665** |

# Greenhouse Production Statistics (vegetables) - estimated

- 4,090 Australian Vegetable Farmers (AusVeg June 2008)
- 29% of all Australian vegetable growers farm in Protected Cropping

# Greenhouse Production Statistics (cut flowers) - estimated

| State | Greenhouse Area (ha) | No of Growers |
|---|---|---|
| QLD | 19 | 112 |
| NSW | 12 | 170 |
| VIC | 36 | 135 |
| SA | 8 | 47 |
| WA | 23 | 94 |
| TAS | 2 | 29 |
| **Totals** | **101** | **587** |

# Why Greenhouse?

- You can grow:

any plant!

anywhere!

anytime!

Modern controlled production systems provide similar climate to native plant location

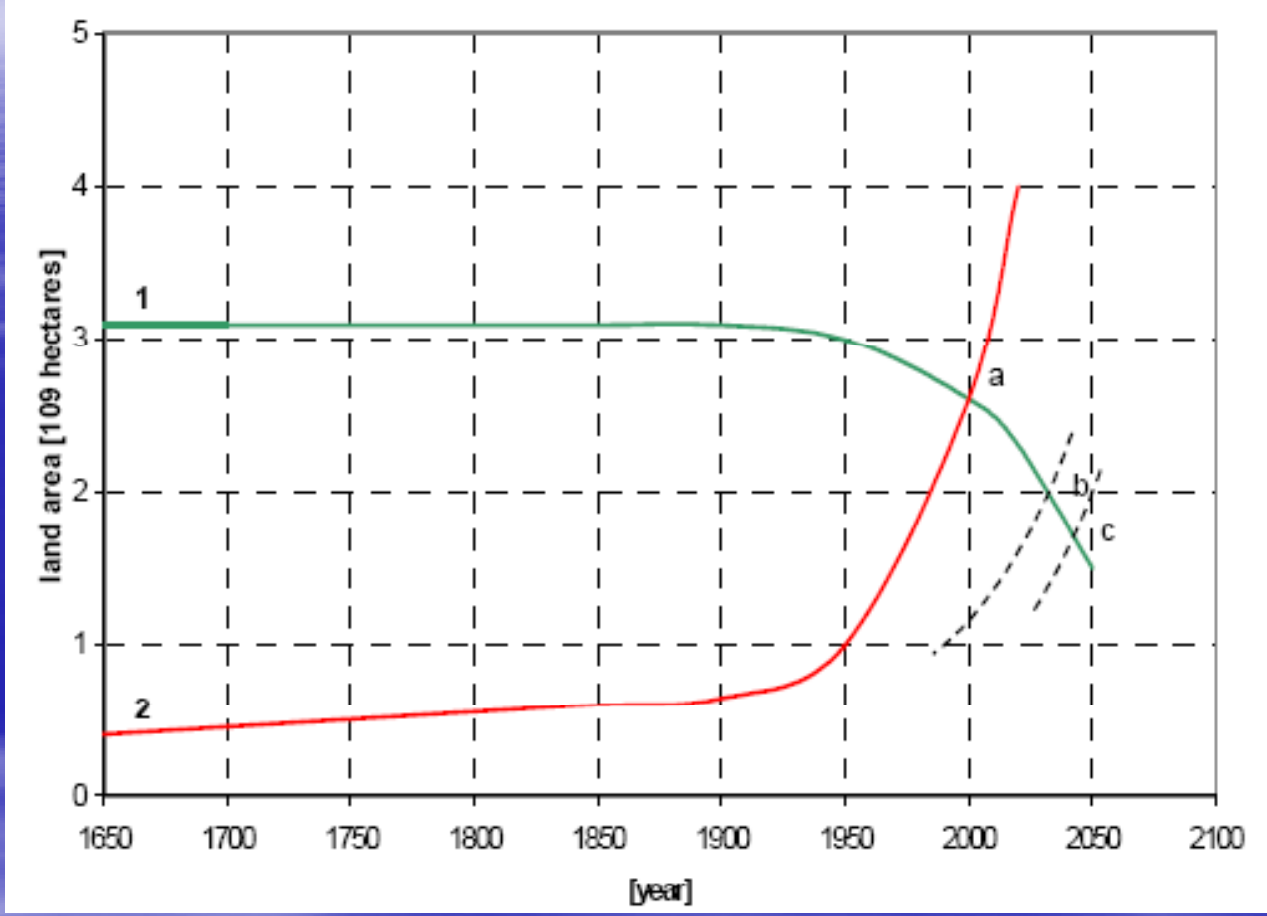
# Why Greenhouse?

- Faster growth
  Higher yields
  Better quality
  } **by significantly improving the growing environment**
- Grow out of (& extend) seasons
- Grow foreign plants in local climate
- Pests can be excluded or controlled
- No weeds, no weeding, no herbicides
- Much reduced impact on the natural environment (significant reductions in herbicides, insecticides, fungicides, fertilisers, waste-water and land area
- Higher outputs on significantly smaller footprints
- Delivers major energy & water efficiencies

# Why Greenhouse?

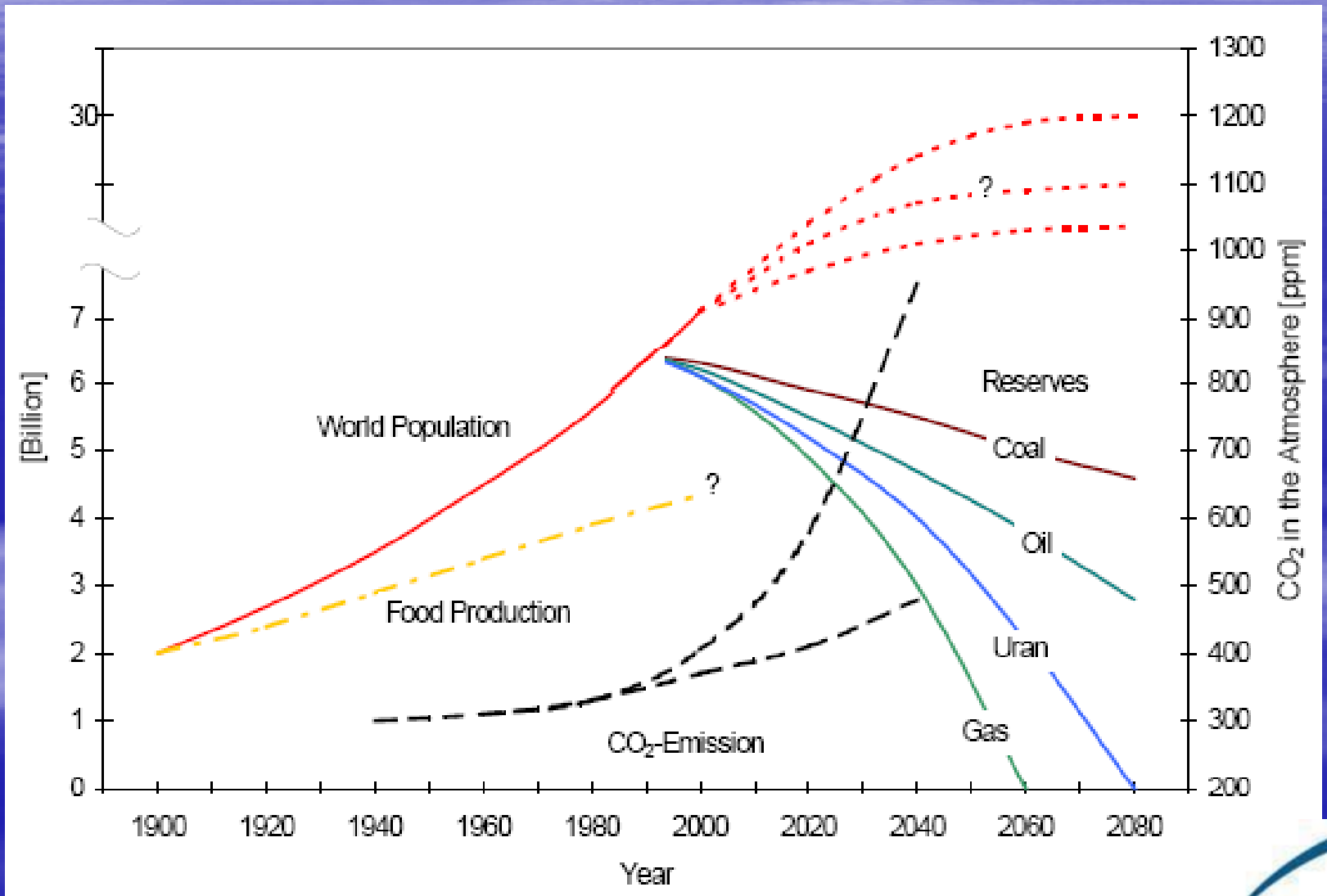
- Closed systems can deliver near zero waste water all year round.
- Marginal land is generally not an issue.
- Controlled environment allows better use of IPM and beneficial insects with much reduced sprays.
- Higher Brix (sugar) levels delivers sweeter flavoursome fruit and longer shelf life.
- Year-round supply of consistent quality and quantity to meet consumers needs.
- Environmentally sound and responsible growing system.
- Able to produce local foods close to urban environments, keeping food miles low.
- Higher returns for farmers efforts. (compared to traditional annual vegetables)

# Growing Population and Decreasing Arable Land Space

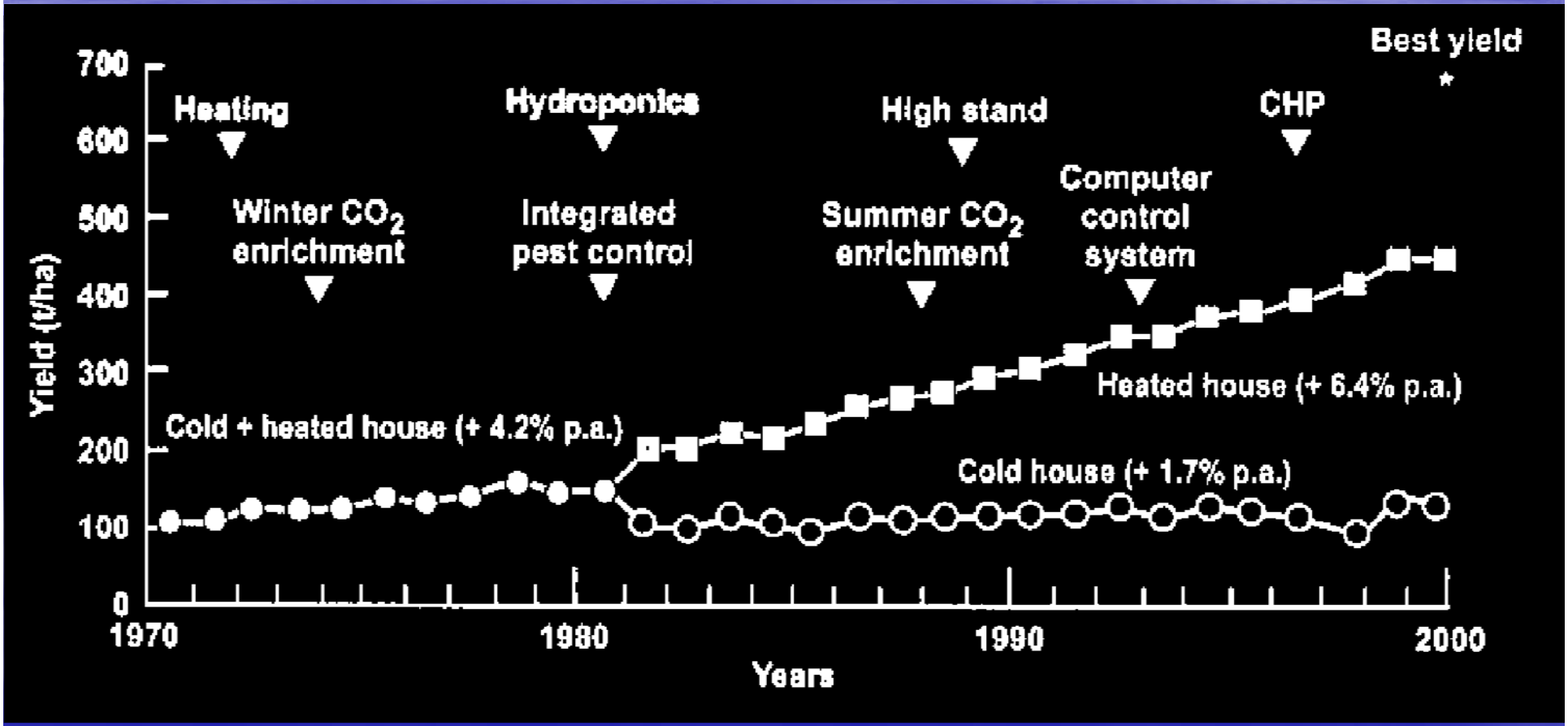



- 1 – usable world-wide agricultural land
- 2 – world population x 0.4ha (1 acre)
- a – culmination point if 0.4ha is required to feed one person
- b – culmination point if 0.2ha is required to feed one person
- c – culmination point if 0.1ha is required to feed one person

# Energy Reserves, World Population & Food Production

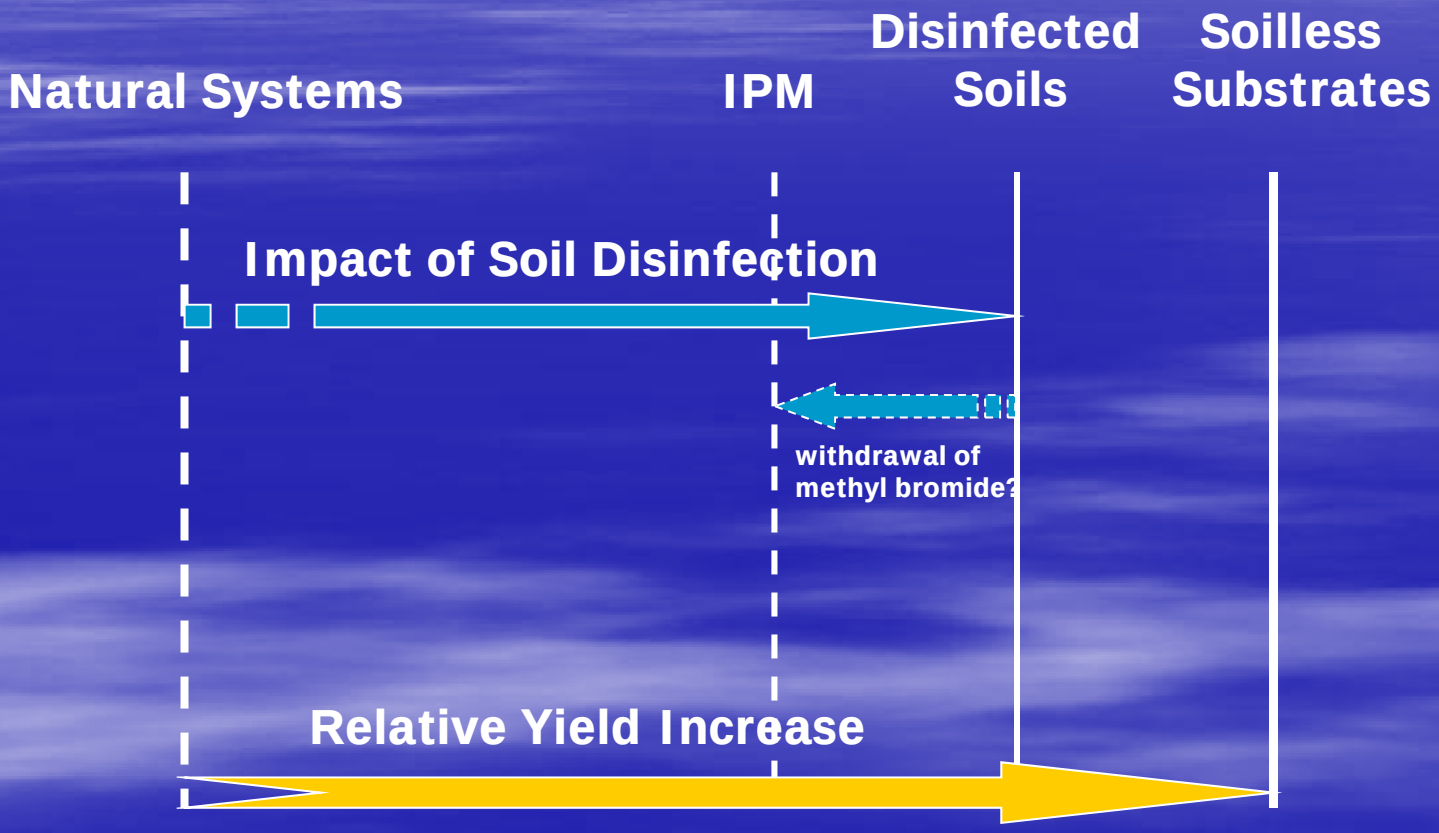


# Why Greenhouse?



# Crop Productivity

## Natural v Controlled Systems




**Biological Equilibrium (maximum biodiversity)**

**Controlled Systems: (reduced biodiversity - less nutrient & water competition)**

# Why Hydroponics?

Greenhouse Production = Risk Mitigation

Risk Reduction in:

1. Adverse weather risk
2. Productivity risk
3. Quality risk
4. Food safety risk
5. Pest & disease risk
6. Financial risk
7. Employment risk
8. Water risk

Time to invest in safe agribusiness due to increasing global demand for high quality foods at a time of apparent global weather extremes that are acting to reduce reliable production

# Greenhouse v Field Production
## Advantages & Efficiencies

| Crop | Tomatoes | Capsicum | Cucumber | Lettuce | Flowers |
|---|---|---|---|---|---|
| Greenhouse (kg/m2) | 76 | 30 | 100 | 80 | 95% |
| Field (kg/m2) | 18 | 12 | 20 | 10 | 5% |
| Efficiency Gains (%) | 422 | 250 | 500 | 800 | Total |

# Water Use Efficiencies

| Agricultural Sector | Litres of Water per $100 of Output |
|---|---|
| Rice | 470,000 |
| Cotton | 160,000 |
| Dairy – Milk | 147,000 |
| Sugar | 123,900 |
| Beef Cattle | 81,200 |
| Vegetables & Fruit | 37,900 |
| Wheat & Grain | 24,500 |
| Hydroponic Crops | As low as 600 |

# Greenhouse V Field Tomato Production

| CASE STUDY | Field | Greenhouse | % Increase |
|---|---|---|---|
| Size (n.b. 1ha = 10,000m2) | 1ha | 1ha | 0 |
| Plant density (ave/m2) | 1.1 | 2.2 | 100% |
| Total Plants | 11,000 | 22,000 | 100% |
| Annual Production (kg) | 69,231 | 585,000 | 845% |
| % 1st Grade | 80+% | 95+% | 12% |
| Effective Production (1st grade kg) | 58,846 | 555,750 | 944% |
| Effective Production (kg per m2) | 5.9 | 55.6 | 944% |
| Effective Production (Kg per Plant) | 5.3 | 25.3 | 472% |

# Greenhouse V Field Tomato Production

| CASE STUDY | Field | Greenhouse | % Increase |
|---|---|---|---|
| Water Use (*) | 8M/L | 14.5M/L | 182% |
| Conversion Rate (grams fruit per litre water) | 7.4 | 38.2 | 519% |
| Production per M/L (tonnes) | 8.7 | 40.2 | 465% |
| Market Returns (gross) | $82,385 ($1.40/kg) | $1,667,250 ($3/kg) | 2,024% |
| Crop Length (months) | ± 7 | 11.5 | 164% |
| Equivalent Field Production (Ha) | 1 | 9.4 | 944% |

# Greenhouse V Field Tomato Production

- When reviewing the production figures, it appears on the surface that greenhouse production uses more water than field production, however it's worth noting greenhouse production occurs over 11.5 months compared to ± 7 months for field production.

- The greenhouse production figures also include all water used, not just that put on crops (i.e. fogging, roof sprinklers, hand washing, staff facilities, etc.).

- The important point is the conversion rate of water used to tomatoes produced, and it shows greenhouse production clearly in front (500%+).

# Protected Cropping Industry Drivers

- **Safe Foods**

  **Controlled production systems are able to more reliably offer products that meets both food security guidelines and the ever discerning needs of consumers.**

- **High Quality**

  **Products reliably scan out at 95%+ compared to field product of between 50 – 80%.**
  **High quality also delivers alternative packaging and presentation options with enhanced shelf-life.**

- **Reliable Supply**

  **12 months supply is available as climate variations are largely removed in protected cropping and this is highly prized by retail & wholesale customers**

# Hydroponic Product Definition
## (provides a point of product differentiation)

Produce that is grown in a soilless system or container, isolated from the ground, with all its nutrients in the feed water.

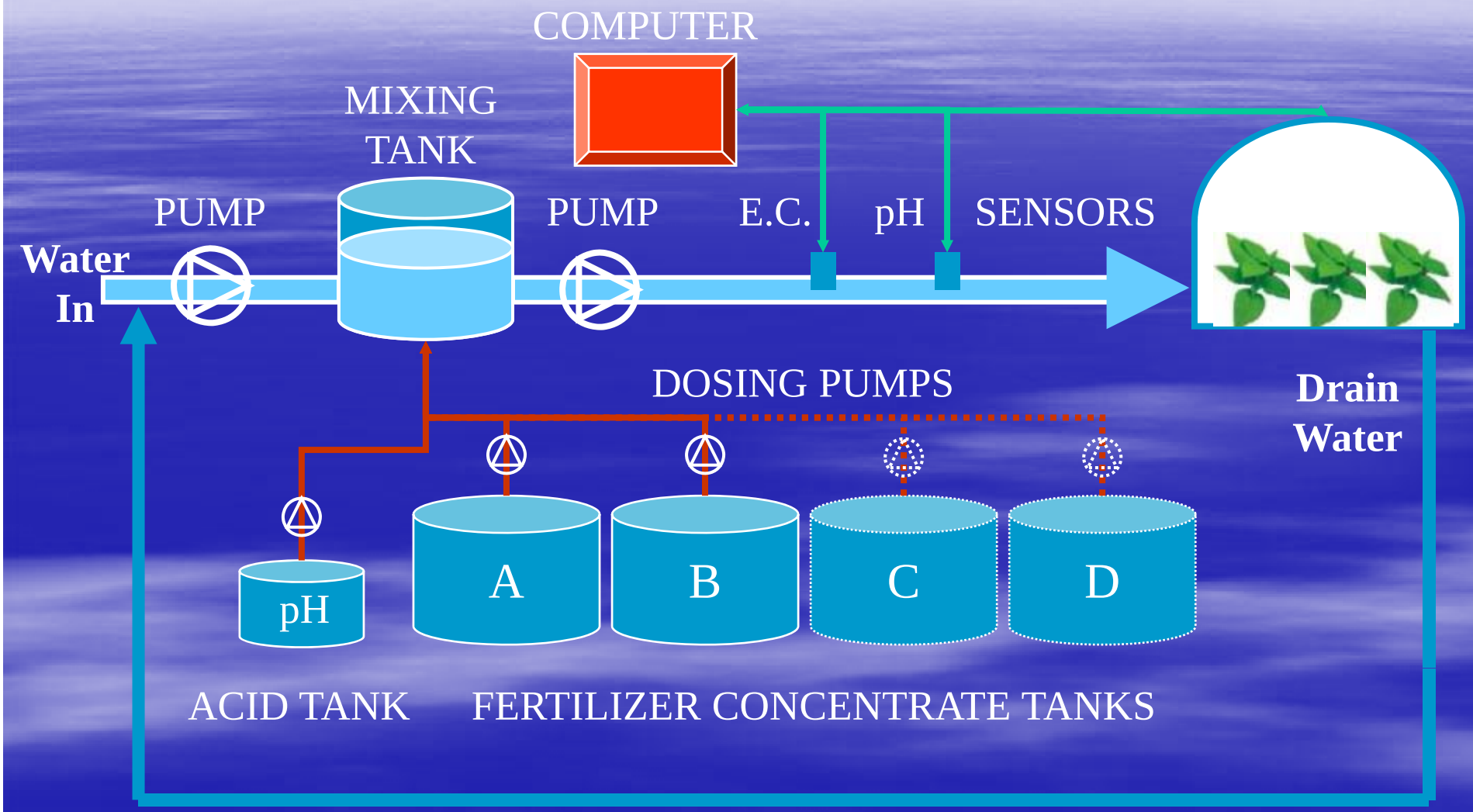
(AHGA 1999)

# Return on Investment $ (industry estimates)

- Older technology
  3 – 5%

- Newer technology
  20 - 25%
  (much higher than traditional annual vegetables)

# How it Works


COMPUTER
MIXING TANK
PUMP
PUMP
E.C.
pH
SENSORS
Water In
Drain Water
DOSING PUMPS
pH
A
B
C
D
ACID TANK
FERTILIZER CONCENTRATE TANKS

# System Types

- **Nutrient Film Technique**
  (lettuce, herbs, Asian vegetables, etc)
- **Flood & Drain**
  (nursery seedlings, potted plants, etc)
- **Aeroponic**
  (orchids, some leafy vegetables, etc)
- **Media Based**
  (vegetables, cut flowers, fruit, etc)

# **Older** Greenhouse Technology

# Greenhouse Technology

# Greenhouse Technology

# Greenhouse Technology

# Greenhouse Equipment

# Greenhouse Equipment

# Greenhouse Equipment


PCA


PCA

# Greenhouse Equipment


PCA

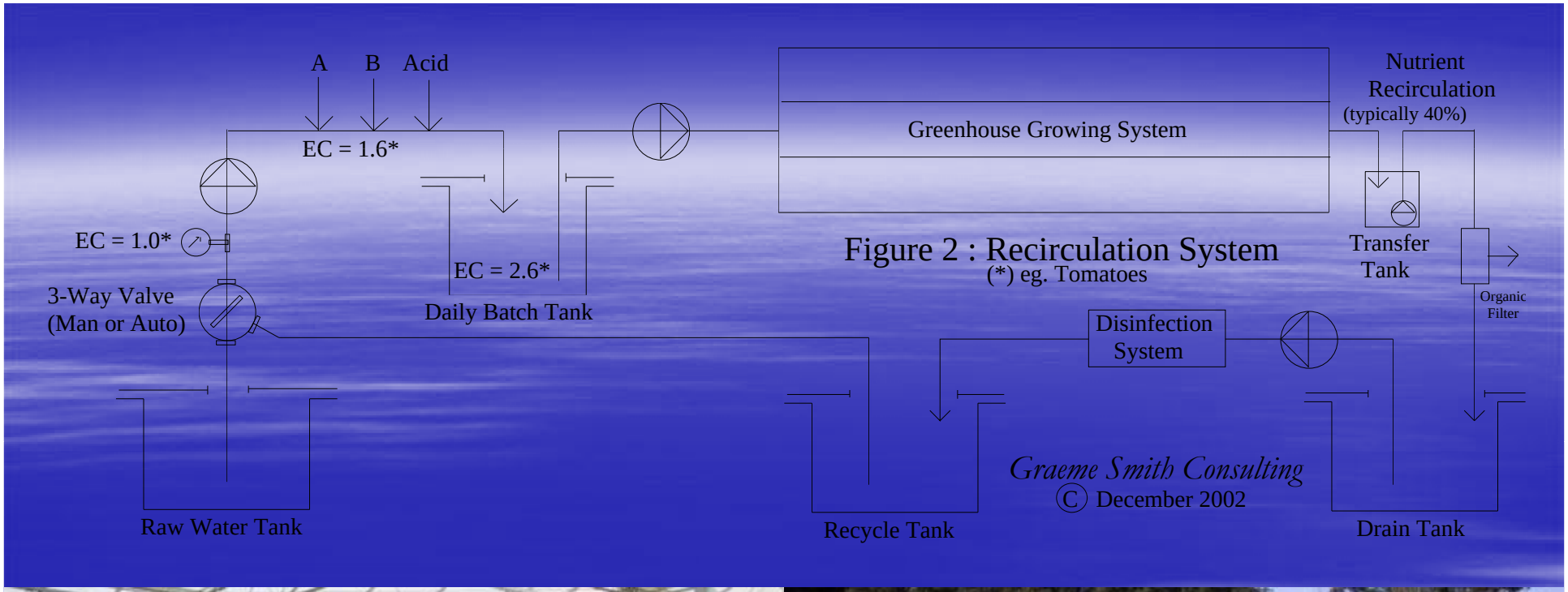
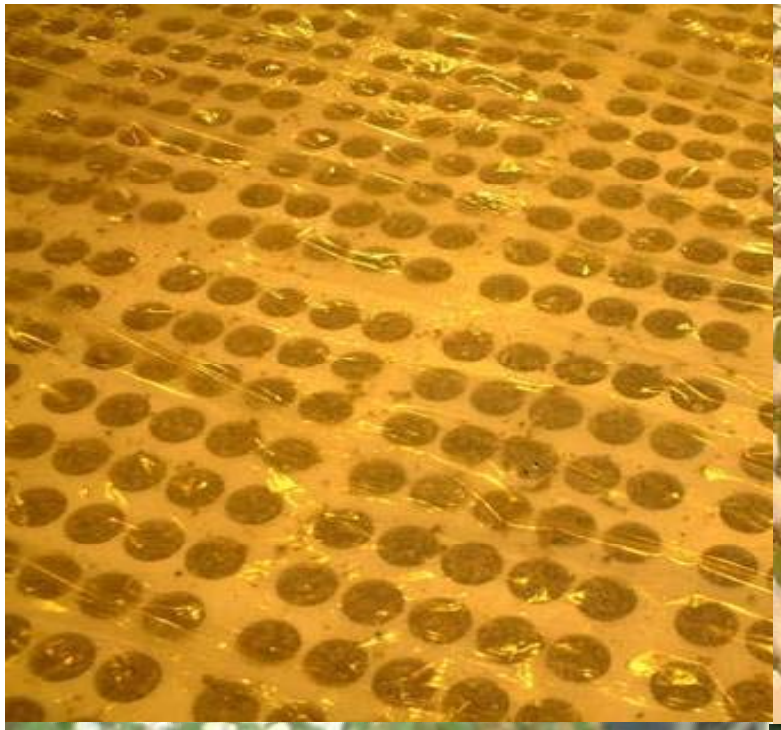



Figure 2 : Recirculation System
(*) eg. Tomatoes


PCA



# Common Greenhouse Crops

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# **Common** Greenhouse Crops

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# Common Greenhouse Crops

Fodder is grown in UV-stabilised, food quality PVC channels, using a NFT system.

oponic green feed grows to a height of
oximately 250-300mm.

PCA

# **New** Greenhouse Developments



PCA

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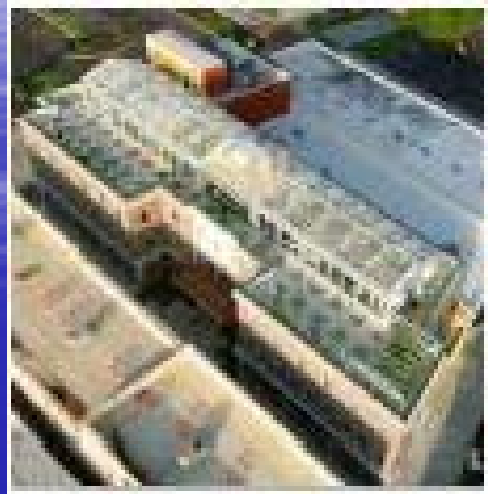




# New Greenhouse Developments

# **New** Greenhouse Developments

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# Compare Lettuce Systems – Production Potential (annual 2Ha Footprints)

- Field: ± 500,000 units
- Standard Fixed-Channel Hydroponic: ± 3,000,000 units
- Moving Gulley System: ± 8,000,000 units

## Future Urban Farmer?

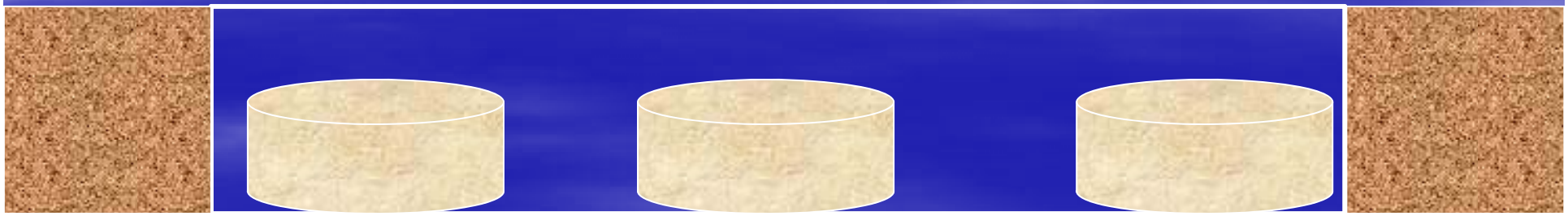
Some will farm on urban land Blocks
as small as 1 acre (4,000m2)

## Future Urban Farmer?

Some will dig a 2.4m hole in the ground

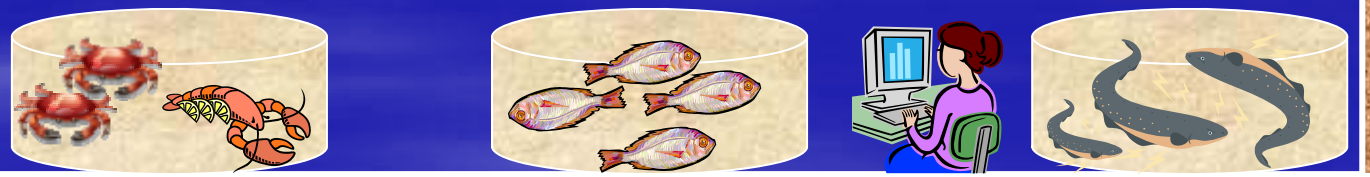
## Future Urban Farmer?

Water tanks can be
installed into this hole



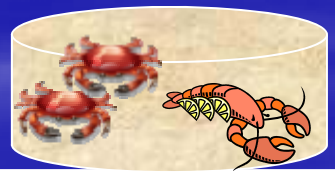
## Future Urban Farmer?

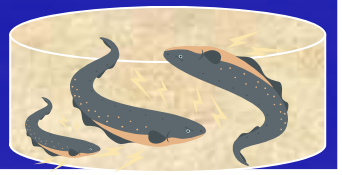
Tanks can be filled with fish
or crustaceans to develop
an aquaculture farm



# Future Urban Farmer?

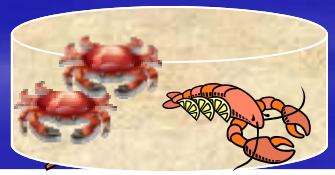
Fish do not require natural light, so a roof can be installed

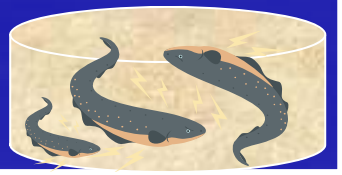




## Future Urban Farmer?

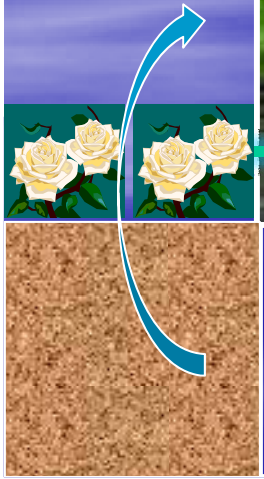
A n automated ‘moving gulley’ hydroponic system can be installed on top of this roof

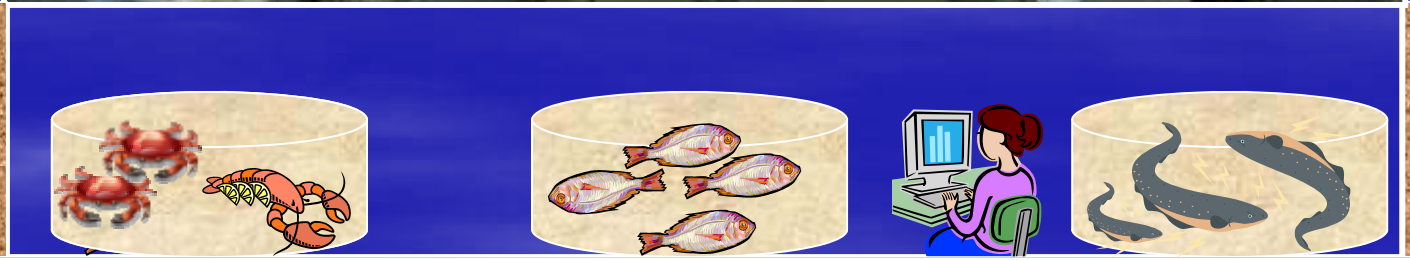


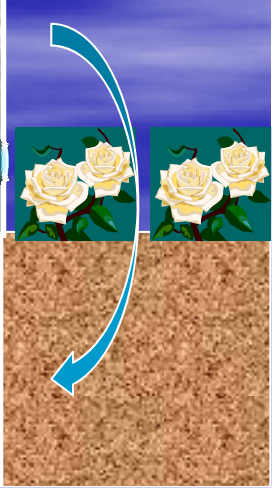


# Future Urban Farmer? A greenhouse is installed to control the climate

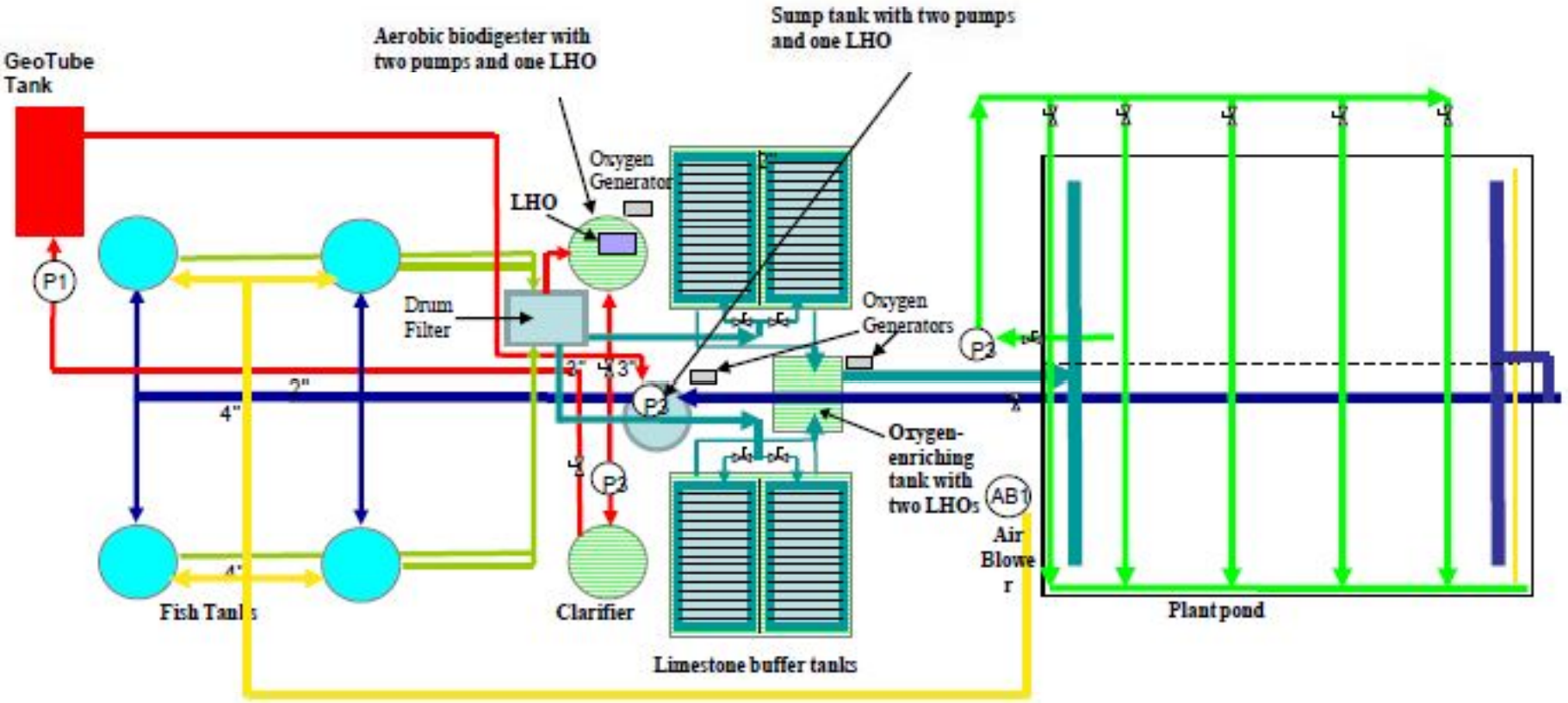
Fish form an organic part of the nutrient cycle







# Layout of a High-Yielding quaponics farm based on Canadian design




Alberta
Freedom To Create. Spirit To Achieve.

Bio-Industrial Technologies

# Future Urban Farmer?

Greenhouse crops have Heat &
$CO_2$ Demand
(resulting in some flue emissions)

# Future Urban Farmer?

‘Combined Heat & Power’ (CHP) units provide heat and $CO_2$ for greenhouse and excess energy production to grid
(with no emissions)

Future Urban Farmer?
Grid-Connect Energy delivery to local homes

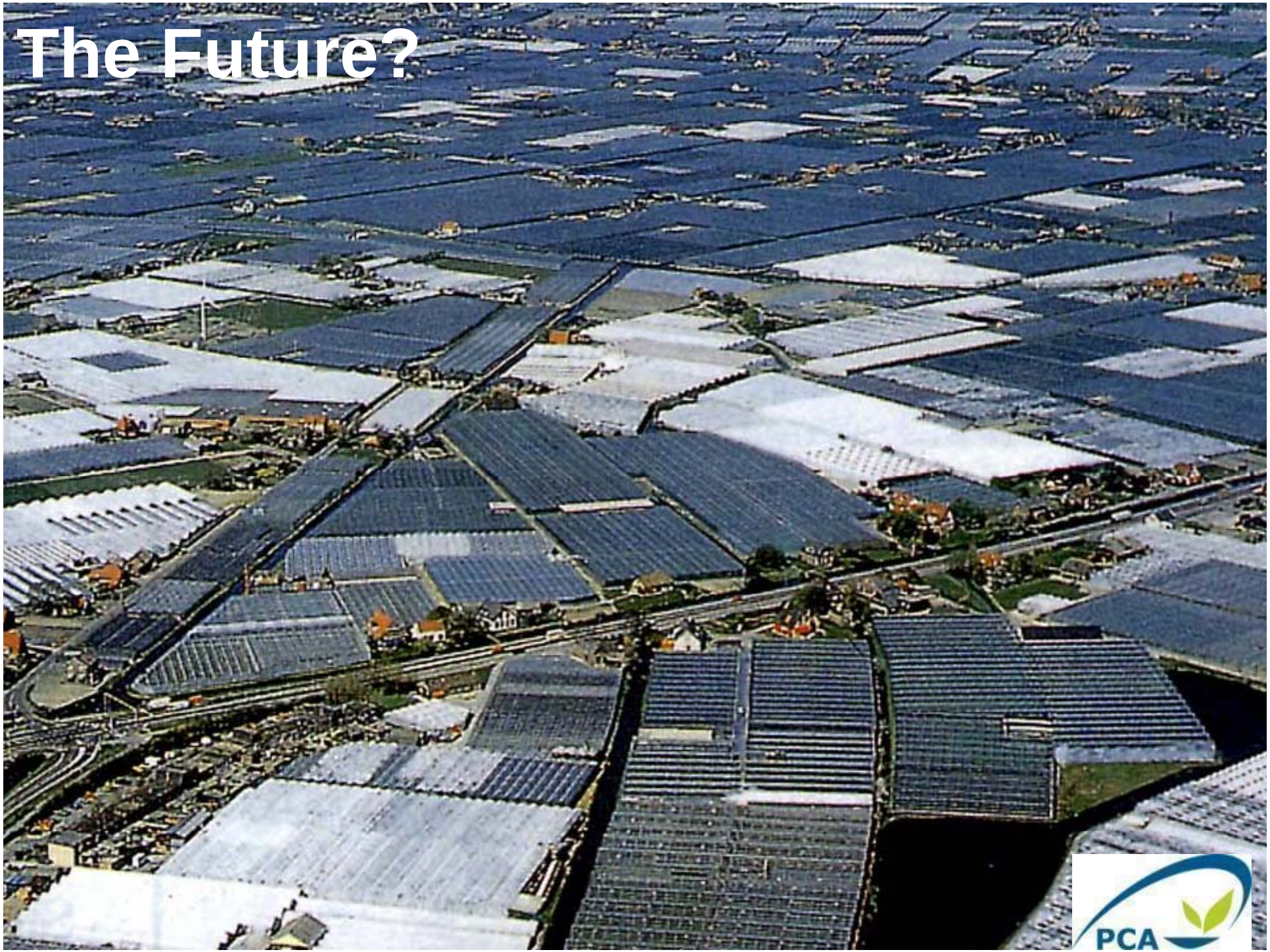
# Future Urban Farmer & Controlled Production Systems

- Produce in aquaponic systems a range of vegetable foods and fish (4,000m2, 1acre ±1.3million lettuce/herbs/asian greens & ±30tonne fish)
- Produce high-efficiency cogeneration energy to grid (95% v 35%) with low emissions
- High multiple food outputs on small footprints
- Low multiple water use and zero effluent (converts effluent stream into a revenue stream)
- Low environmental & social impacts
- Local urban organic foods keeping food miles low
- Controlled sustainable production systems are the modern face of horticulture

# Protected Cropping Development Needs

- Suitable land (minimal contours)
- 3-Phase power (suitable for grid-connect)
- Quality water (well treated recirc water OK)
- Natural Gas (heat, $CO_2$ & energy generation)
- Access to labour
- Municipal support for development in urban areas
- Training Centre for Controlled Environment Horticulture (centralised training, R&D, technology demonstration, minor use registration, bio-control development, centre for energy and water use efficiencies, industry benchmarking & standards, automation and robotics in horticulture, etc

# The Future?



**New Australian Greenhouse Projects - 2006 - 2011 + (estimates only!)**

| | | | Area in Hectares (est.) | | | |
|---|---|---|---|---|---|---|
| Location | State | Crop | Size 2006 | Size 2011 | Planned Expansion | FutureTotal |
| Noosa | QLD | Tomatoes | 0.0 | 2.2 | 2.0 | 4.2 |
| Brisbane | QLD | Tomatoes | 0.0 | 2.0 | 0.0 | 2.0 |
| Guyra | NSW | Tomatoes | 5.0 | 20.0 | 20.0 | 40.0 |
| Griffith | NSW | Tomatoes | 0.8 | 3.0 | 2.0 | 5.0 |
| Central Coast | NSW | Tomatoes | 3.0 | 5.0 | 0.0 | 5.0 |
| Newcastle | NSW | Tomatoes | 0.0 | 0.0 | 16.0 | 16.0 |
| Warragul | VIC | Tomatoes | 8.0 | 14.0 | 6.0 | 20.0 |
| Tatura | VIC | Tomatoes | 2.2 | 4.7 | 5.0 | 9.7 |
| Mansfield | VIC | Tomatoes | 1.0 | 3.0 | 2.0 | 5.0 |
| Katunga | VIC | Tomatoes | 1.0 | 6.0 | 0.0 | 6.0 |
| Bunbury | WA | Tomatoes | 0.3 | 0.3 | 0.0 | 0.3 |
| Perth | WA | Tomatoes | 1.1 | 4.0 | 0.0 | 4.0 |
| Two Wells | SA | Tomatoes | 0 | 17.6 | 10.0 | 27.6 |
| Maryborough | VIC | Tomatoes | 0.5 | 0.5 | 1.5 | 2.0 |
| Virginia | SA | Tomatoes | 2.0 | 5.0 | 2.0 | 7.0 |
| | | Totals | 24.9 | 87.3 | 66.5 | 153.8 |
| | Potential Market Size (ha est.) | | | 55.1 | 37.5 | 92.6 |

| Location | | Crop | Size 2006 | Size 2011 | Planned Expansion | Total |
|---|---|---|---|---|---|---|
| Devonport | TAS | Capsicum | 1.0 | 3.0 | 10.0 | 13.0 |
| Perth | WA | Capsicum | 0.5 | 2.0 | 0.0 | 2.0 |
| Warragul | VIC | Capsicum | 0.3 | 1.0 | 2.0 | 3.0 |
| Geelong | VIC | Capsicum | 0.0 | 0.0 | 1.5 | 1.5 |
| | | Totals | 1.8 | 6.0 | 13.5 | 19.5 |
| | | Potential Market Size | | 3.0 | 10.0 | 13.0 |

| Location | | Crop | Size 2006 | Size 2011 | Planned Expansion | Total |
|---|---|---|---|---|---|---|
| Virginia | SA | Cucumber | 0.0 | 0.0 | 5.0 | 5.0 |
| | | Totals | 0.0 | 0.0 | 5.0 | 5.0 |

| | | | | |
|---|---|---|---|---|
| All Crop Totals | 26.7 | 93.3 | 85.0 | 178.3 |
| | | | $220 | /m2 |
| | | | 850,000 | m2 |
| investment capital (est.) | | | $ 187,000,000 | |

# Thank You.

# Questions?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