Food production – greenhouse and field
Processing and getting it safely to the consumer
What is the current focus in Ontario?

- Production and the biology of need
  - Water is needed for growth, (calories per drop), and
  - Waste/wash water can result in unwanted growth – and unwanted cost

- Processing and the efficiency of use
  - Efficiency of use (carbon impact, cost of use),
  - Wastewater as a regulatory/cost avoidance opportunity
What is driving the research? WQ²
Primary Production

Research Issues include:
• Access to a high quality resource
• Compliance with water-taking and discharge regulations
• Efficacy of use
  • more crop per drop and more gain than rain
• Convergence of compliance and sustainability
  • Current disconnect

Who is active:
• Producer Groups with OMAFRA, MOE and AAFC
  • e.g. LADI (Leamington Area Drip Irrigation system)
• UofG Engineering, Food Science, Environmental Sciences; Waterloo; Western; Toronto; McGill
• Soil Resource Group ... and others
GH water quality and quantity characterization (TOGA/SWIP/ABP)

Leach 117.5 121.7 79.99 70.58 93.31 128.7 160.3 186 207.2 143.4 183.9

ppm

<table>
<thead>
<tr>
<th>Date</th>
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<td>11-Oct-12</td>
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</table>
OMAFRA Food Safety Program
Food Processing

Issues include:

- The water-energy nexus
  - $1 of water in a food plant can drive $9 to $18 in other costs
  - Water drives up to 40% of a food processor’s processing carbon footprint
- Wastewater impact on municipal systems
- Zero discharge penalized for consumption

Who is active:

- UofG Engineering, Food Science, OMAFRA & MOE on BMP’s
- Toronto, Bloom Centre, OMAFRA on technology pilots (BioGill)
Research connections

Pond Biofuels & St Mary’s

CO₂

Amarjeet Bassi, Western

Greenhouse runoff water

algae

biofuel

biofuel
Some Other Jurisdictions

Alberta – irrigation management
  - crop stress versus soil moisture triggers; impact on crop

California – minimizing post-harvest irrigation
  - Production impact vs processing impact of reducing quality
  - 2 million acres of irrigated capacity may be lost this decade

Quebec – AAFC/Laval – organic cluster

Stockholm International Water Institute (SIWI)
  - World leader on water-energy-food nexus
  - Focused on calories per drop through the value chain
What’s next?

Opportunity for “Net Zero” discharge

- Re-use in processing
- Closed loop production - optimal crop per drop
- Supply chain impact of improved outputs

- Closing the logic gap between compliance and sustainability

- Moving ideas and technology from researcher/innovator to industry BMP’s
Innovation, Adoption and Risk

- **Innovation & Research**
  - Early Stage Public & Commercial Research
  - Pilot proof of concept for commercial viability
  - Demonstrate commercial viability & R.O.I.
  - Outreach & Awareness campaign
  - Operational Best Practice for Industry

- **Industry Technology Adoption**
  - Innovators 2.5%
  - Early Adopters 13.5%
  - Early Majority 34%
  - Late Majority 34%
  - Laggards 16%

- **KTT Zone**

Source: Meyers and Bick, OMAHA, 2011