DairyWater

Water consumption and direct energy use in the Irish dairy processing industry

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Presentation contents

- Irish dairy industry
- DairyWater project
- Environmental sustainability KPIs
- Discussion and conclusions

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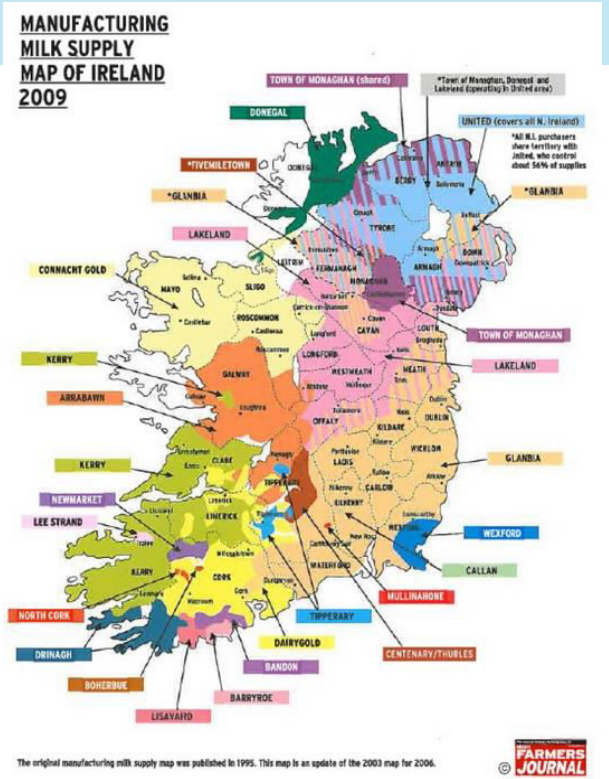
Irish dairy industry

- Raw milk production in Ireland: 5.4 billion litres from 17,000 dairy farmers[1]
- There are 6 main dairy processors
- European milk quotas were abolished (Mar ’15)
  - Resulting in a potential increase of 50% in domestic raw milk production
  - Increase in water usage: from 13.5 billion litres to ???
  - Many plants at water emissions limit
  - New technologies sought to maintain profits and adhere to regulations



1. IFA. 2014. Dairy Fact Sheet. Vol. 2014. Irish Farmers Association, Dublin, Ireland.

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DairyWater project

- Aim: Develop sustainability and resource efficiency for the Irish dairy processing industry
  - Presentation at WWCXV on Wednesday (10.30)
- €1 million project funded by the Department of Agriculture, Food and the Marine (DAFM)
- Comprises 5 research institutions: NUI Galway; Trinity College Dublin; University College Cork; Athlone IT; Teagasc
- Includes a project advisory board which include representatives from EI, EPA, Teagasc and industry stakeholders

DairyWater project

Molecular analysis of IASBR technology

Secondary treatment of wastewater using IASBR technology

Lead Organisation NUIG
PI: Prof. Xinmin Zhan

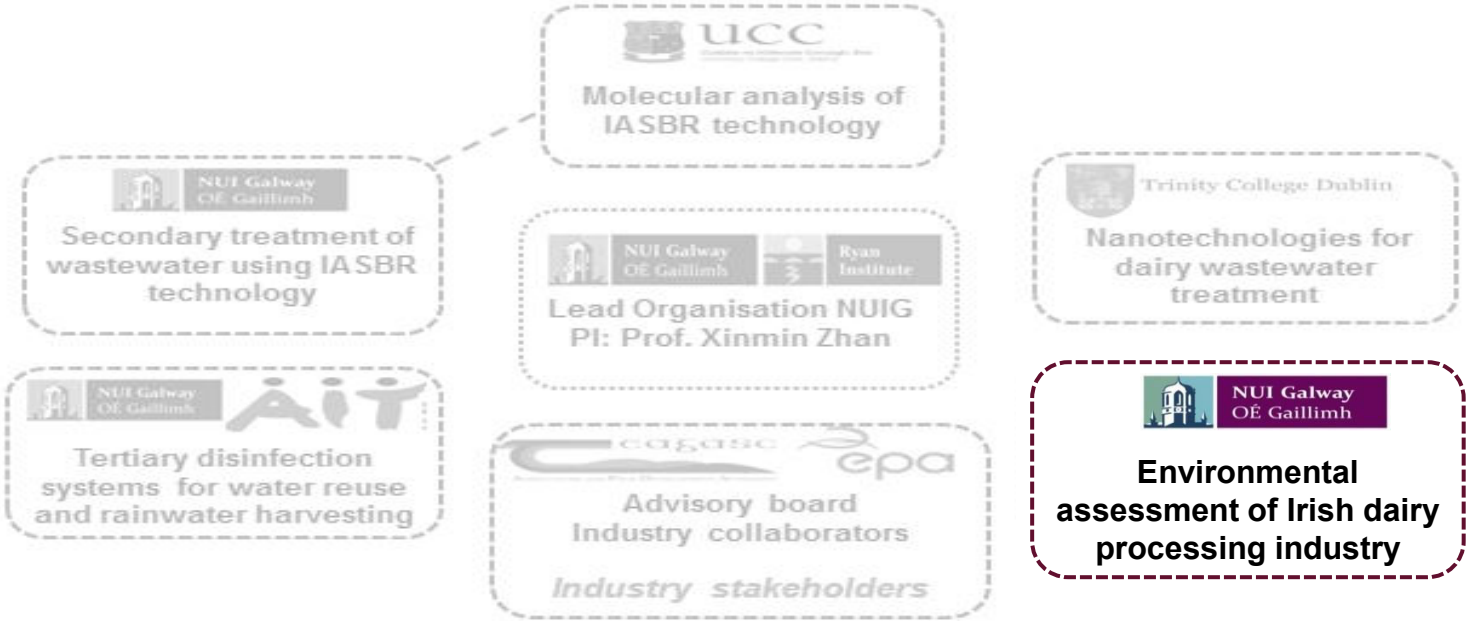
Nanotechnologies for dairy wastewater treatment

Tertiary disinfection systems for water reuse and rainwater harvesting

Advisory board
Industry collaborators
Industry stakeholders

Environmental assessment of Irish dairy processing industry

DairyWater project



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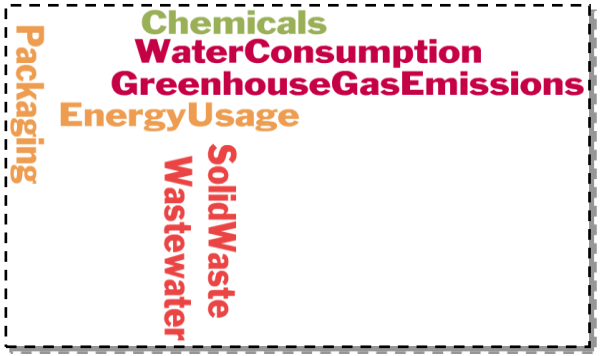
Environmental sustainability assessment

- In this project, two methods for assessing the environmental sustainability of the Irish dairy processing industry are used:

Environmental life cycle assessment

Environmental key performance indicators (KPIs)



Environmental sustainability KPIs

- Water consumption
- Energy usage
- Greenhouse gas emissions
- Packaging used
- Solid waste/bi-products produced
- Wastewater produced
- Chemicals usage

Direct water consumption within dairy processing plants

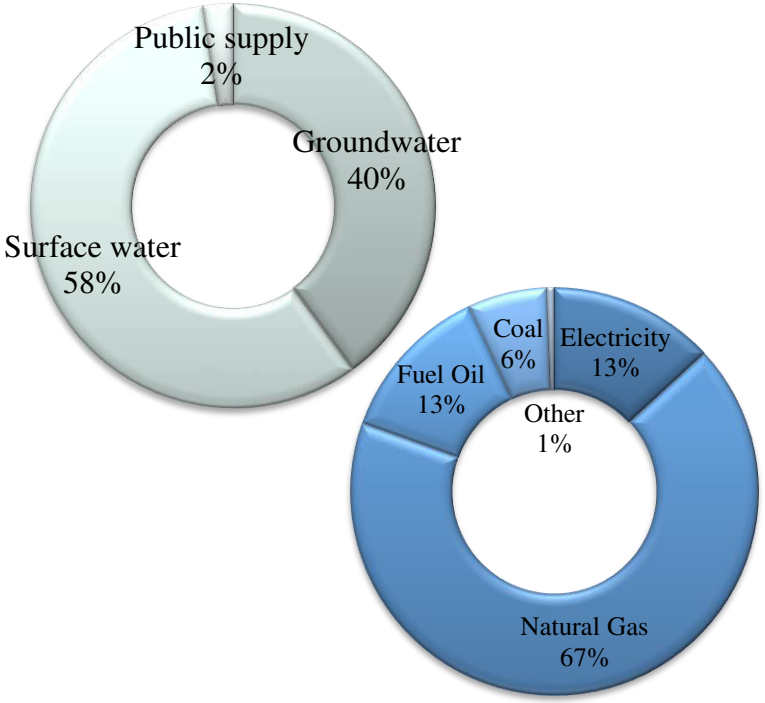
Direct electrical and thermal usage within dairy processing plants

Finnegan et al (2015)[2]

2. Finnegan, Goggins, Clifford & Zhan. 2015. Global warming potential associated with dairy products in the Republic of Ireland. *J. Clean Prod.*

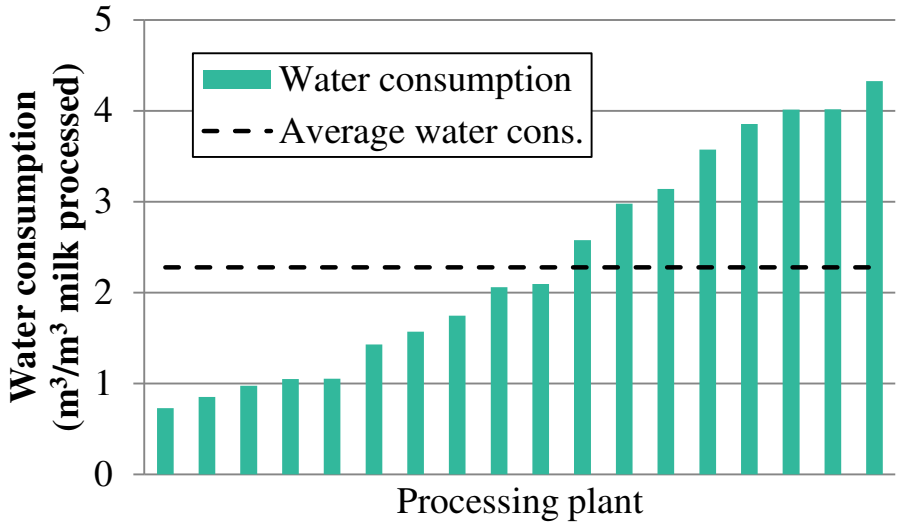
Environmental sustainability KPIs

- Data from 18 dairy processing plants (12 companies) for 2013 is used
- Accounts for over 95% of the milk processed in 2013 (5830.7 million litres of raw milk)
- The total water consumption, for the plants surveyed, was approximately 13 billion litres
- The total direct energy usage, for the plants surveyed, was approximately 2.7 TWh
  - Electrical energy: 0.6 TWh
  - Thermal energy: 2.1 TWh



Direct water consumption

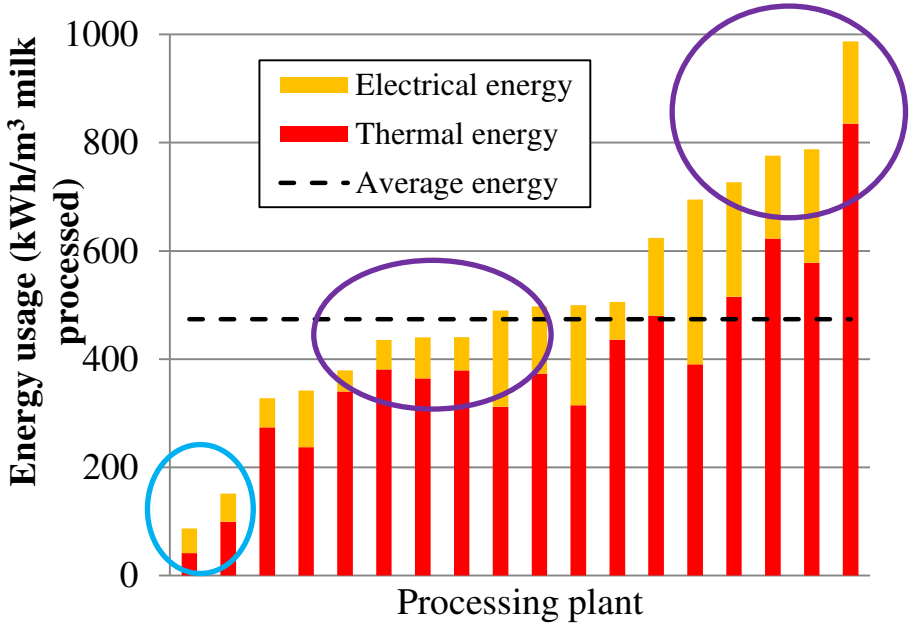
- The majority of water used within dairy processing plants is for cleaning
  - Clean-in-place (CIP) systems
- Some processes (cheese-making) require large quantities of water
- Water consumption in 2013 was approximately 2.28 m^3 per m^3 milk processed
  - Ranges from 0.73 to 4.33
- In Australia, water consumption in 2011 was 1.75 m^3 per m^3 milk processed[3]



3. Barr, D., van Burren, N., 2013. 2010/2011 Australian Dairy Manufacturing Environmental Sustainability Report. *DMSC*

Direct energy usage

- Direct energy usage in 2013 was approximately 474 kWh per m^3 milk processed
  - Electrical energy: 114 kWh per m^3 milk processed
  - Thermal energy: 360 kWh per m^3 milk processed
  - Ranges from 80 to 1140
- In Australia, direct energy usage in 2011 was 392 kWh per m^3 milk processed[3]



* Geraghty, R., 2011. Resource efficiency in Ireland's dairy processing sector. *Enterprise Ireland*

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Discussion and conclusions

- Water reduction measures are required and there is plenty of scope to do so
  - The reuse of condensate within dairy powder plants is necessary
- Streamlining production within plants to one or two products, where possible, may reduce energy consumption and, thus, increase profitability
- Complete the study for the other KPIs
  - Disseminate the results to each plant individually
- Use the results of the study to indicate processing plants which are performing well and use their feedback to establish ‘best practise’ guidelines for the industry
- Revisit the study with 2015 data to investigate the affect of the quota abolition on the performance and environmental sustainability

DairyWater

Questions???

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