



Research for dairy product development

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Research for dairy product development

- Quality and the supply chain
- Current issues
- Opportunities to add value
- Future developments

AFBI

Food Science

Microbiology, Chemistry,
Biochemistry, Sensory,
Genetics ...

**Enhancing
Food Quality**

**Ensuring
Food Safety**

CAFRE Loughry
Technology

University of Ulster
Human Diet and Health

NI Dairy Industry
Commercial Knowledge

**Dairy Product
Research**

Quality Assured

ISO17025 / ISO9001

**National Reference Lab
For Milk and Milk Products**
2008-2018

**Complementary
Expertise in AFBI**

Hillsborough Dairy Unit
Loughgall Grass Breeding
Sustainability

“Supporting ... industry innovation across the agri-food and rural sector ...”



Environment	Farming	Crops	Transport	Quality	Consumers
Soil	Grass	Animals	Fish	Processing	Safety
Water	Feed	Poultry	Dairy	Storage	Shelf-life
					Regulation
					Economics

Factors affecting quality and safety



Animal genetics

Composition of grass/diet

Animal health

Animal husbandry

Hygiene on farm

Hygiene at dairy

Milk treatment

Product manufacture

Packaging

Distribution and storage

Retail

Consumer



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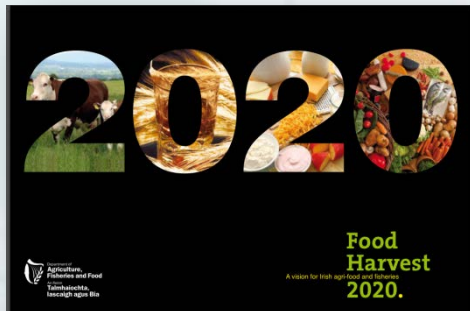
Current Issues

Going for Growth



- High % for export
 - milk powder, cheese, butter
- Incentives for improvements in milk solids
- Greater uptake of innovation
 - e.g., infant formula products/ingredients

Harvest 2020



- Removal of quotas and increased production
- Added value potential
 - e.g., nutraceuticals and functional foods
- Irish grass-based milk products

Current Issues

Milk availability - Trends ... (FAO, 2012)

- Increased consumption and production in developing world

Milk availability

Trends in production and demand and medium-term outlook

Stefano Gerosa and Jakob Skoet

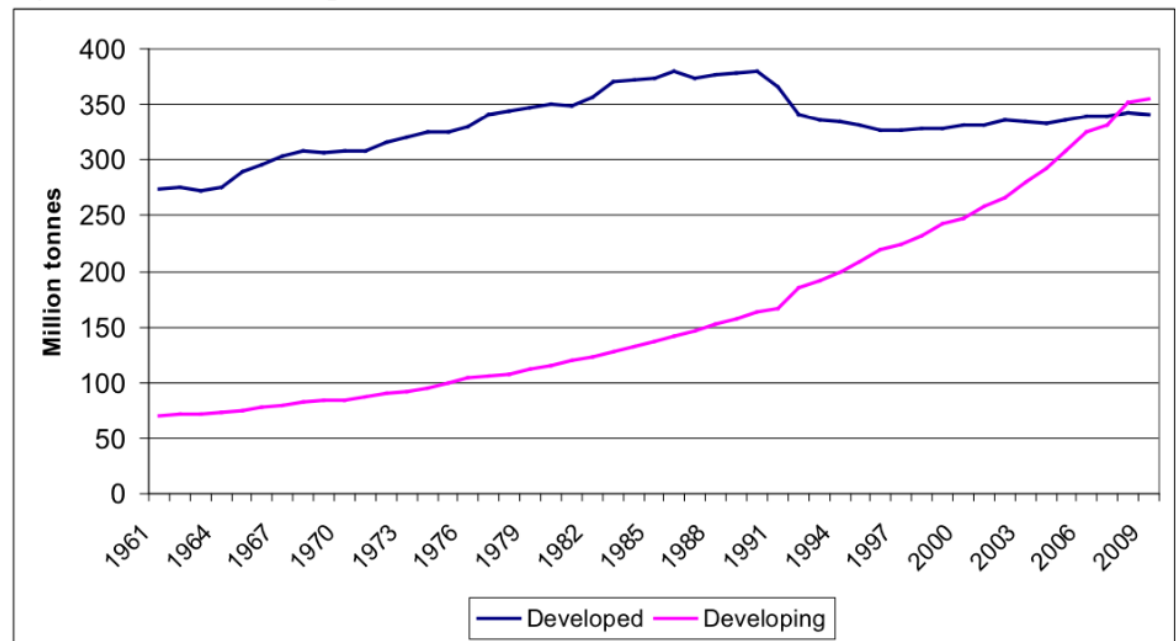
ESA Working paper No. 12-01

February 2012

Agricultural Development Economics Division
Food and Agriculture Organization of the United Nations
www.fao.org/economic/esa



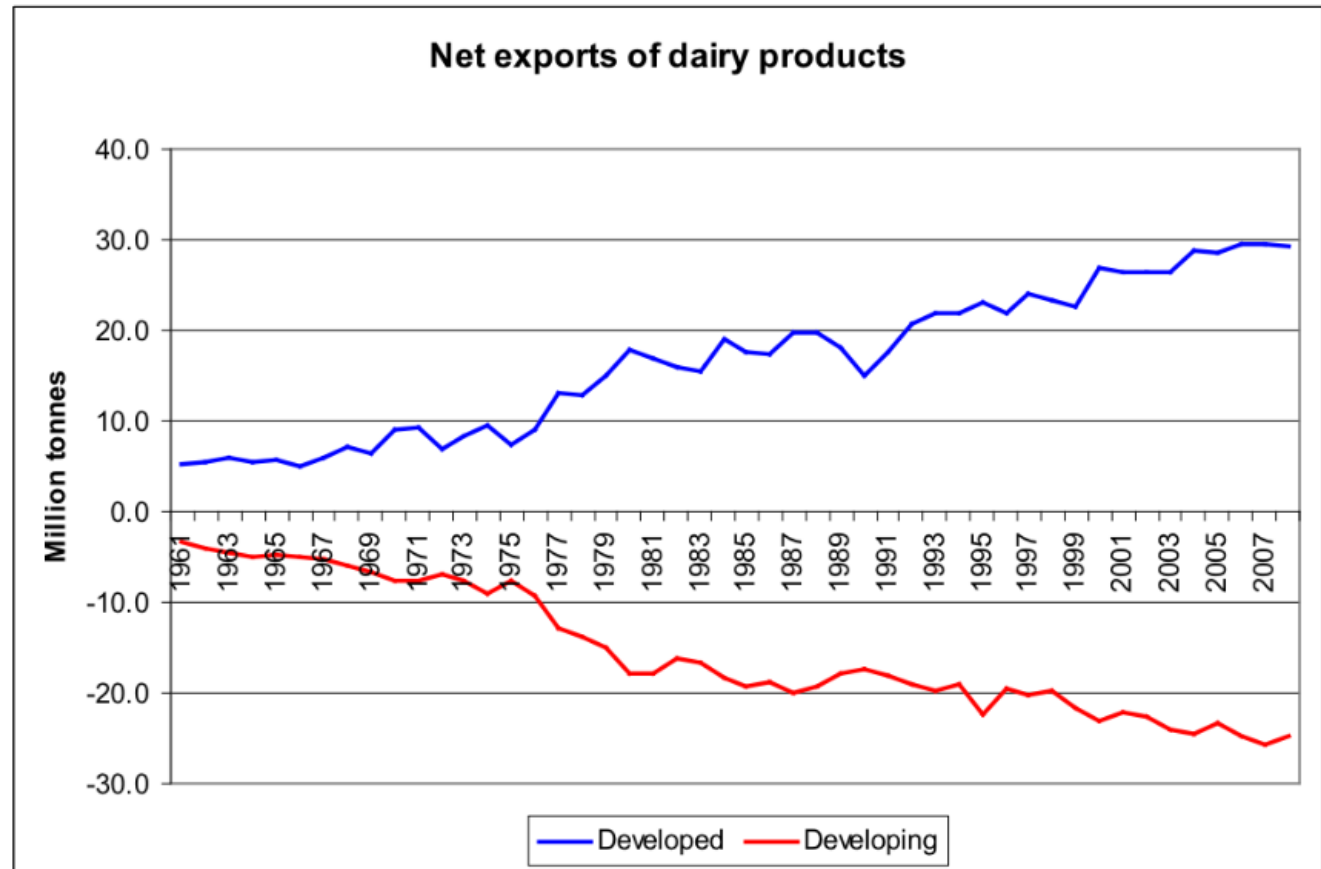
Figure 11 – World milk production 1961- 2009 (million tonnes)



Source: FAOSTAT

Current Issues

Figure 14 - Net exports of dairy products of developed and developing countries.



Source: FAOSTAT

- Export trends

Milk availability
Trends in production, demand and medium-term outlook

Stefano Gerosa and Jakob Skoet

ESA Working paper No. 12001

February 2012

Agricultural Development Economics Division

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www.fao.org/economic/esa

Research for dairy product development

- Production, quality and safety
- Current issues
- Opportunities to add value
 - Enhancing lipid composition
 - Optimising vitamins
 - Advanced processing
- Future developments

Health Challenges



Fats

- Dairy products and meat are the largest contributors of saturated fat to our diet
- BUT the impact of milk and dairy products on health is under review!
- Drive to provide consumers with healthy products

Vitamins

- Ireland and the UK are two of the largest consumers of milk in the EU
 - This makes milk an important source of protein and calcium but also of other essential nutrients such as iodine and vitamin D

Opportunities to add value

Enhancing the fat composition - naturally

Naturally spreadable butter

- Increasing the content of unsaturated fatty acids in milk fat
- *Funded by "InvestNI", Dromona Quality Foods, with support from Marks and Spencer, Thompsons, NI farmers*



Benefits of organic milk

- Higher content of omega-3 linolenic acid and conjugated linoleic acid (CLA) in organic milk
- *Funded by DARD*

Healthier Ice Cream

- Ice cream with reduced saturated fat content
- *Funded by Unilever*

Opportunities to add value

Production of omega-3 enriched milk on-farm

Goal

Production of omega-3 enriched milk on-farm for the manufacture of novel dairy products

Initial results & next steps

- Microalgae dietary supplement enhances omega-3 fatty acids in cow's milk
 - 500 % increase in milk fat DHA content
- Animal feed intake affected
 - Lower supplement concentrations to be investigated
- Yoghurt manufacture with Loughry (CAFRE)

Funded by DARD, 2013-16



Opportunities to add value

Reduced fat cheese fortified with omega-3 fatty acids

Fortification of cheese milk with long chain omega-3 fatty acid DHA during manufacture

Optimised through choice of supplement and point of addition

Novel approach to choice of starter cultures

Steering group - industry, CAFRE and DARD



Outcome

Production of an acceptable reduced fat cheese that could be labelled as a "source of omega-3"

Funded by DARD, 2011-14, with industry advice and support

Opportunities to add value

Healthy cows, healthy milk, healthy consumers

Challenge

- To optimise the nutritional value of milk and dairy products - on farm and in the factory
- Lack of information on the nutritional content of NI milk

Current work

- AFBI-UU Collaboration - two PhD studentships
 - Potential of cow's milk to increase vitamin D intake in NI consumers
 - *CAST studentship with Dairy Council (NI)*
 - Nutritional aspects of NI milk (iodine and selenium)
 - *DARD studentship*



Opportunities to add value

“Free range” grass fed beef and milk

- Many people are “insufficient” in Vitamin D
- Does milk produced from low-input, outdoor grazed grass systems provide more vitamin D than milk from housed animals?
- Can we maintain vitamin D levels during indoor production periods?



Research project funded by DARD and LMC (2012-2015)



Opportunities to add value

Novel food processing techniques

High pressure processing

- HP rigs for research and pilot commercial work
- Approved preparation facilities for commercial use

Microwave volumetric heating

- Delivers microwave energy evenly into flowing liquids



Effect on safety and quality

- Shelf-life testing
- Challenge testing
- Chemistry
- Sensory quality

Opportunities to add value

High pressure inactivation of *Listeria* for soft cheeses



- Soft, mould-ripened cheeses have been implicated in cases of listeriosis
- Cheese prepared from spiked raw milk, always contained *Listeria monocytogenes*
 - None detected in cheese produced from milk that had been pressure-treated

Outcome

- High pressure processing would be suitable as an alternative to pasteurisation for the pre-treatment of milk used for the manufacture of soft cheese.
 - Retains some of the raw milk characteristics of the cheese, but with enhanced microbiological safety

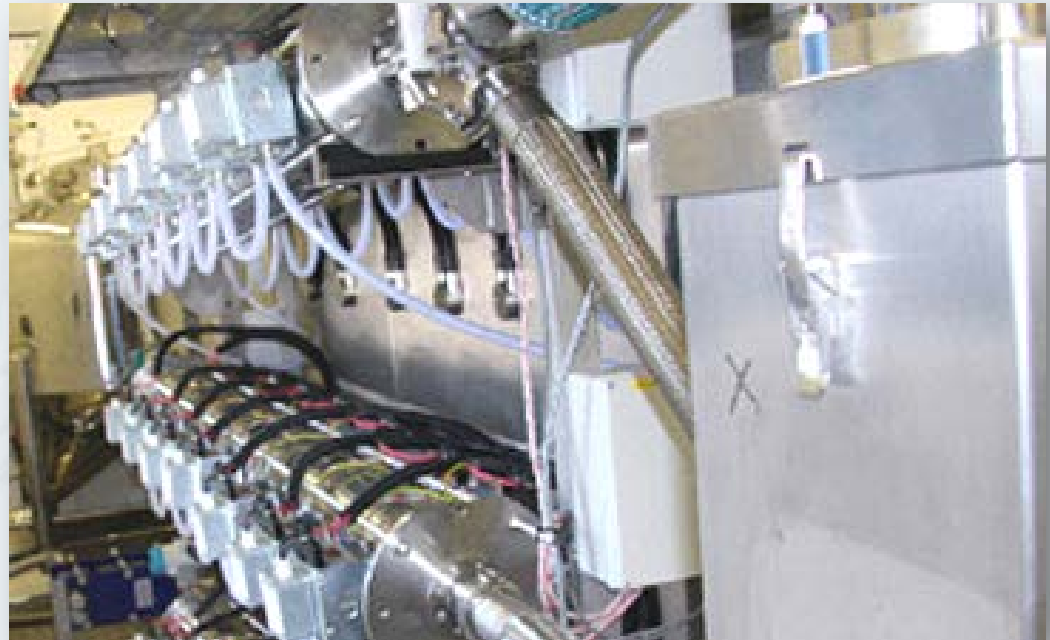
Opportunities to add value

Microwave Volumetric Heating

- Unique method of delivering microwave energy evenly and deeply into flowing materials on a continuous basis
- MVH gives microbial inactivation at lower temperatures than conventional heat treatment
- Any pumpable liquid is suitable - milk, cream, flavoured milks etc

Potential

- Possible extended shelf-life and better flavour
- Research applications to DARD and TSB



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- Adding value
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Future Developments


- **Health benefits of dairy products**
 - Bioactive compounds, high whey protein drinks
 - Genetic variants of beta-casein - A1 more easily digested
- **Meeting changing consumer needs**
 - More health aware, long shelf-life, natural, with good flavour, texture
 - Diversity/choice, yoghurts for men!
- **Integrated supply chain**
 - More control, improved consistency of product quality
- **Export opportunities**
 - Technologies for increased shelf-life
 - Milk ingredients - for infant formula, for export to developing countries,
 - Tailored products e.g., for lactose intolerant countries

Conclusions

- “New” emphasis on milk as a healthy component of the diet
- Increased need for extended shelf-life
- Consumer demands

➤ New opportunities

- New/enhanced products
- Milk as a “Source of”
- Making the most of the natural qualities of NI milk
- Longer shelf-life with good quality



Additional information

National Reference Laboratory

- Participating in EU ring trials of somatic cell counts in milks, and alkaline phosphatase in bovine cheese.
- Undertaking a scoping study to determine a conversion factor for automated bacterial counts in raw milk vs. plate counts.
- These studies will underpin changes in EU regulations.
- Acts to relay information from EURL to official control labs.

Specialist services for the dairy industry

- Microbiological analyses (inc. statutory analyses, ISO 17025)
 - milk, water, food, animal feed, composts/fertilisers.
- Serotyping of *Salmonella* spp.
- *Mycobacterium bovis*, *Mycobacterium avium* subsp *paratuberculosis*
- Determination of survival of pathogens in food processing and associated environments
- Monitoring contaminants in food and environment (statutory analyses)

Polyaromatic hydrocarbons, polychlorinated biphenyls, heavy metals, radionuclides.

Research for dairy product development

- Production and links to quality
 - what can be done to influence end product?
- Commodity production and core constituents
 - Impact of composition on market requirements
 - Opportunities to influence composition and safety of commodity products
- Opportunities to add value
 - Spreadable butter, move on to more recent examples, , Vit D, folic acid etc (Se, Vit E?)
 - HPP and MVH
 - Newly recognised health benefits of milk - Ian Givern
 - Pricing scheme for milk - pay on volume or quality
- Must show AFBI's research is critical to help industry and support sustainable growth
- Show X-links to production and sustainability

Future Developments

- **Consumer demands are changing**
 - American approach - health aware, long shelf-life, natural, diversity/choice, yoghurts for men!
 - High quality with flavour, texture
- **Long shelf-life**
 - Products for export, reduced shopping frequency
- **Health benefits of dairy products**
 - bioactive compounds, high whey protein drinks
 - Genetic variants of beta-casein - A1 more easily digested
- **Milk ingredients**
 - for infant formula, for export to developing countries, tailored products e.g., for lactose intolerant countries