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Development of an integrated farm and processing sector model for the Irish dairy industry



Key external stakeholders:

Dairy farmers, Dairy processors, Cattle Breeding organisations, DAFM

Practical implications for stakeholders:

The outcome/technology or information/recommendation is.....

- Optimum configuration of the Irish dairy industry
- Optimum milk supply profile for the Irish dairy industry
- Development and the introduction of multiple component pricing systems
- Development of seasonal milk pricing systems for Ireland
- Quantification of the potential expansion post milk quota removal
- Evaluation of the economic affect of increasing grazing season length in Ireland

Main results:

A milk processing and a milk transport model was developed for the Irish dairy industry.

A Seasonal milk supply profile was shown to be more profitable to the Irish dairy industry than moving towards a less seasonal (split calving 50% spring, 50% Autumn) milk supply profile.

A seasonal supply profile with a mean calving date of mid-February relative to mid-March is optimal for the farm and processing sector.

The optimal structure of the Irish dairy industry is to have 6 milk processing sites located in: North West, Mid West, Munster West, Munster SW, Munster East, South Leinster.

Models have simulated that there will be a 45% increase in milk output by 2020 post milk quota removal

Opportunity / Benefit:

The project has developed milk pricing strategies around both seasonal milk payment and the multiple component pricing systems, demonstrating how rapidly such systems can act as a signal to farmers. This project is responsible for methodologies for most processors in Ireland around the A+B-C systems of milk payment. Using these methodologies seasonal milk payment systems for various milk processors have been developed. The identification of locations where expansion will occur nationally has helped the decision making process around building additional processing capacity. The modelling of expansion by 2020 has reinforced the view that the Food Harvest 2020 targets can be achieved.

The Moorepark Processing Sector Model (MPSM) has been developed and can be used in further analysis (e.g. EBI development, quantifying animal health issues on product yield and quality).

Collaborating Institutions:

RERC, UCD, UCC, CIT

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1. Project background:

Milk quota removal have presented real opportunities for the dairy industry to generate increased milk production and higher returns and ultimately higher industry profitability (farmer and processor alike). However for the Irish dairy industry to truly reap the rewards of this policy change a number of questions needed to be answered: will milk production in Ireland increase when quotas are abolished, if so where will it be produced, is the current structure of the processing sector adequate to process it, should the processing sector continue to process at a peak to trough ratio of 6.0 to 1, should the milk supply profiles be flattened or should there be more plant capacity constructed with expansion, if additional plant capacity is required where should it be constructed? Therefore to help inform the optimal strategy for the industry, that is profitable for both the farmer and processor alike while maintaining international competitiveness, clarity on each of these issues was essential.

2. Questions addressed by the project:

To develop a milk processing sector and milk transport model for the Irish dairy Industry
What is the most profitable milk supply profile for the Irish dairy industry as a whole (farmer and processor)?
What milk price, value per kg of fat and protein should be paid to farmers?
Where is the expansion in milk production likely to occur?
What effect will (i) increased milk output, (ii) different tanker sizes and (iii) different supply patterns have on milk transport costs and on carbon emissions from milk transport?
What effect will the projected expansion in milk supply have on the processing capacity of the Irish dairy industry?
In terms of capacity investment what is the optimal site location and scale of the required investment to support the future milk supply?

3. The experimental studies:

The Moorepark Processing Sector Model (MPSM) was developed which simulates the production of dairy products. The MPSM estimated the quantities of products and by-products that can be produced from the available milk pool. Processing costs are simulated, and the return from raw milk and its individual component values are calculated. The MPSM was linked with Moorepark Dairy Systems Model (MDSM) to examine the effect of a change within the Irish dairy industry (change to the milk supply profile, increased milk production etc) throughout the dairy system. In addition a simulation/optimization milk transport model was developed for the Irish dairy industry. This model allowed the examination of a wide range of efficiency factors in milk transport, it was also used to examine processing capacity, investment requirements and to help determine the optimal expansion strategies in terms of site location and scale. Data from the National Farm Survey was used to model expansion post milk quota removal.

4. Main results:

1. A mean calving date of mid-February relative to a mean calving date of mid-March is more profitable for the Irish dairy industry, generating an additional net profit of €17.7 million per annum.
2. Moving from a seasonal milk supply profile with a mean calving date of mid-February to a less seasonal milk supply profile with 50% of the herd calved in spring and 50% calved in autumn results in a reduction in industry profit of €83 million per annum. Therefore the seasonal milk supply profile is more profitable than the less seasonal milk supply profile.
3. Milk output expected to increase by 2020;
@26 cents/L. Projected increase in milk supply: 25% South, 22% SouthWest, 15% East, 9% Rest
@28 cents/L. Projected increase in milk supply: 43% South, 38% SouthWest, 27% East, 34% Rest

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- @30 cents/L. Projected increase in milk supply: 52% South, 42% SouthWest, 44% East, 37% Rest
4. Increase in volume resulted in an increase in milk transport costs but at a decreasing rate (volume effect)
 5. Tanker with capacity of 27,360 litres are more economical and environmentally friendly compared with tankers with capacity of 22,800 litres
 6. The optimum structure of the Irish dairy industry is 6 sites: North West, Mid West, Munster West, Munster SW, Munster East, South Leinster. An increase in capital costs of 50% did not effect the optimum configuration

5. Opportunity/Benefit:

The project has developed milk pricing strategies around both seasonal milk payment and the multiple component pricing. This project has quantified the benefits associated with staying with the current seasonal milk supply profile and it demonstrated that the optimum strategy for the dairy industry centres around remaining with the seasonal milk supply profile and expanding milk output through building additional processing capacity at a number of optimum sites. The identification of locations where expansion will occur nationally has helped the decision making process around building additional processing capacity. The MPSM and MDSM are available to support any analysis for the Irish dairy industry. The research carried out in this project clearly demonstrated the power of component milk pricing systems and how rapidly such systems can act as a signal to farmers. Over the duration of this project numerous one to one meetings with processors and their boards have been completed resulting in the implementation of the A+B-C milk pricing systems. The Authors are responsible for methodologies for all processors in Ireland around the A+B-C systems of milk payment. They also have developed seasonal milk payment systems for various milk processors.

6. Dissemination:

Thirteen peer reviewed publications were produced from this work. The results of the project were widely disseminated at national and international conferences and in popular press media (TRResearch 2009-11 and Farmers Journal 2010). Research from the project was presented at the IDF World Dairy Summit 2009-11; the Agricultural Research Forum and the British Society for Agricultural Science 2010, 2011, 2013; Agricultural Economics Society of Ireland conferences 2010-11; Moorepark Open days, Irish Transport Research Network conferences and UCC Doctoral conferences. The A+B-C multiple component milk pricing system developed in this analysis will continue to be used in consultation with milk processors. The MPSM developed as part of this project will be used to help estimate the cost of mastitis to the milk processing sector.

<http://www.agresearchforum.com/publicationsarf/2013/proceedings2013.pdf> pp.43

<http://www.agresearchforum.com/publicationsarf/2011/proceedings2011.pdf> pp. 73

<http://www.agresearchforum.com/publicationsarf/2010/proceedings2010.pdf> pp. 335

Main publications:

Geary, U., Lopez-Villalobos, N., Garrick, G. and Shalloo, L. 2012. An analysis of the implications of a change to the seasonal milk supply profile in the Irish dairy industry utilising a seasonal processing sector model. *Cambridge Journal of Agricultural Science*, **150**: 389-407.

Geary, U., Lopez-Villalobos, N., Garrick, G. and Shalloo, L. 2010. Development and application of a processing model for the Irish dairy industry. *Journal of Dairy Science*, **93**: 5091-5100.

Quinlan, C., Shalloo L., Keane, M., O'Connor, D., Enright P. and Geary U. 2012. The interaction between economies of scale and transport costs in the Irish dairy industry. *Journal of Dairy Science* (Accepted).

Popular publications:

Geary U and Shalloo L. Mastitis and farm profitability. *TRResearch*, Vol 6: Number 4. Winter 2011

Geary U and Shalloo L. A milk processing sector model for Ireland. *TRResearch*, Vol 5: Number 4. Winter 2010

Geary U, Shalloo L and Hennessy T. Milk processing, utilisation and pricing. *TRResearch*, Vol 4: Number 2. Summer 2009

Laepple, D., Hennessy, T. and O'Donoghue, C. 2010. Farm Demography and the Opportunities for Dairy Expansion in Food Harvest 2020, *Irish Farmers Journal*.

Hennessy, T., Kinsella, A., Moran, B. and Laepple, D. 2010. Benefits of Extending the Grazing Season, *TRResearch* Vol. 5(4), pp. 26-27.

Hennessy, T., Kinsella, A., Moran, B. and Laepple, D. 2010. Benefits of Extending the Grazing Season, *Irish Farmers Journal*.

7. **Compiled by:** Una Geary and Laurence Shalloo
