

Project number: 6267
Funding source: DAFM

Date: December, 2014
Project dates: Nov 2011 – Dec 2014

Barriers to improving economic performance on dairy farms



Key external stakeholders:

Primary producers, processors, policymakers, extension agents and animal health practitioners.

Practical implications for stakeholders:

- The undertaking of this type of research is important given that improvements in animal health, breeding and milk quality are essential if the Irish dairy industry is to grow sustainably and retain a competitive advantage in a post-quota environment.
- The quantification of the economic gains resultant from animal health improvement is important as disease related costs are not always recognised due to sometimes hidden effects.
- An understanding of the potential drivers and barriers of animal health 'best practice' was acquired through this work and the role of extension agents and practitioners in facilitating farmer 'learning by sharing' validated.
- Insight into the design of knowledge transfer best practice was also gained which should help to further shape policy and address the key challenge of how best to engage with those farmers whose behaviour remains sub-optimal with regard to animal health management.

Main results:

The costs of mastitis on farm level profitability were estimated using multiple methods - the Moorepark Dairy Systems Model (MDSM) and panel data econometric models designed using Teagasc National Farm Survey (NFS) data. The MDSM analysis demonstrated that as bulk tank somatic cell count (BMSCC) increased from ≤ 100 ('000 cells/mL) to $>400,000$ ('000 cells/mL), net farm profit decreased by €19,504.

The NFS econometric models found that for farms with a BMSCC of 400 ('000 cells/mL) or greater there is a 2% reduction in productivity (milk yield per cow) compared to the average. In addition, a fall in BMSCC from 400 ('000 cells/mL) to 300 ('000 cells/mL) for an average herd size of 55 cows will likely result in an annual improvement in gross margin of €1,045 or €19 per cow. This figure although lower than the profit differential derived from the MDSM analysis (€52) is based on observed data across a cross-section of dairy farms of all sizes and levels of profitability. Another key finding from the NFS econometric models is the relative importance of farmer behavior in influencing herd-level SCC. According to the models utilised, farmer participation in agricultural training, contact with an extension agent and the undertaking of milk recording resulted in an overall SCC reduction of 25% for the average herd. In line with previous international research this implies that there is an important role for the extension agent, veterinary advisor and other stakeholders in influencing farmer behavior with regard to animal health and technology adoption.

Opportunity / Benefit:

A wide range of policy relevant outputs have been delivered under this project. Results have been disseminated successfully through a number of fora including academic and popular publications as well as academic and national stakeholder conferences, workshops and seminars. In addition a calculator to measure the financial losses caused by mastitis at the farm-level has been developed. This calculator can be used by farmers to help understand the impact that of mastitis on farm-level profitability and is available at: <http://www.agresearch.teagasc.ie/moorepark/docs/costcheck.xls>

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1. Project background:

The improved economic performance of farms and the adoption of output enhancing technologies are critical to achieving the FH2020 target to increase dairy production by 50% by 2020. Indeed, continued improvements in the health status of Irish dairy herds are essential if the industry is to grow sustainably and retain competitive advantage in the aftermath of EU milk quota abolition. The purpose of this project was two-fold: firstly, to quantify the costs and benefits of the adoption of best practice in relation to animal health and secondly, to identify factors affecting adoption rates. In exploring the barriers to achieving improved economic performance at the farm level two case studies were examined: animal health practices and genetic improvements in the dairy herd. The overall objective of the project was to make recommendations for policy and programmes in order to improve knowledge transfer to primary producers that will in turn increase the productivity and efficiency of the dairy sector.

2. Questions addressed by the project:

- What impact do animal health improvements (specifically mastitis prevention) have on farm-level and processor profitability?
- What farm (and farmer) characteristics are important in influencing herd-level SCC?
- What are the drivers and barriers of 'best practice' with regard to animal health (mastitis and AI) at the farm-level?
- How can knowledge transfer be improved to facilitate an improvement in herd health management?

3. The experimental studies:

- The costs of mastitis on farm profitability were estimated using both the Moorepark Dairy Systems Model and farm-level econometric models utilising Teagasc National Farm Survey data.
- The impact of mastitis on the value of milk for the wider processing sector was evaluated using a meta-analysis and a processing sector model.
- Econometric models using NFS data were used to examine the factors affecting herd-level SCC.
- Drivers and barriers of 'best practice' with regard to animal health were identified using both quantitative (NFS) and qualitative (focus group) data collection methods. Results were then used to help inform recommendations for effective knowledge transfer.

4. Main results:

- Analysis of the costs of mastitis on farm profitability using the Moorepark Dairy Systems Model (MDSM) demonstrated that as bulk tank somatic cell count (BMSCC) increased, milk production was reduced and the proportion of the herd culled due to mastitis increased. As BMSCC increased, milk receipts decreased; as a result, total farm receipts were also lower with higher BMSCC thresholds. In addition, as BMSCC increased, the total farm costs increased as more cows were treated and proportionately more cows were culled. As a result, as BMSCC increased from ≤ 100 ('000 cells/mL) to $>400,000$ ('000 cells/mL), net farm profit decreased by €19,504.
- The MDSM was also used to estimate the impact of mastitis for industry (farm and processors) on milk value per litre independent of the effect of mastitis on milk volume. The impact was quantified for Ireland using a meta-analysis and a processing sector model. The analysis showed that as BMSCC increased the production quantities reduced. An increase in BMSCC from ≤ 100 ('000 cells/mL) to $>400,000$ ('000 cells/mL), saw a reduction in net revenue of 3.2% per annum (€51.3 million) which corresponded to a reduction in the value of raw milk of €0.0096 cents/l.
- The quantification of the farm-level productivity and profitability effects of BMSCC reduction was also explored using Teagasc NFS data. This was the first Irish study of its kind to use herd-level nationally representative data (across a cross-section of dairy farms of all sizes and levels of profitability), and to employ panel data econometric techniques, allowing for the control of the effects of unobserved farm-level heterogeneity (i.e., differences across farms). In so doing, the independent

effect of BMSCC on both yield and margins could be isolated. Model results indicate that for farms with a BMSCC of 400 ('000 cells/mL) or greater there is a 2% reduction in productivity (milk yield per cow) compared to the average, highlighting the potential productivity gains from reducing cell count for those in this category. In addition, the model suggests that a fall in BMSCC from 400 ('000 cells/mL) to 300 ('000 cells/mL) for an average herd size of 55 cows will likely result in an annual improvement in gross margin of €1,045 or €19 per cow.

- A key finding from the analysis is the relative importance of farmer behaviour in managing mastitis. According to the econometric models utilised, farmer uptake of agricultural training and herd management practices such as milk recording as well as liaison with extension services are positively related to cell count reduction, all else being equal. Collectively, agricultural training, extension contact and milk recording resulted in an overall SCC reduction of 25% for the average herd. The analysis found that farmers who undertook agricultural training were ten times more likely to monitor milk quality through milk recording compared to those who hadn't. Similarly, those farmers in contact with an extension service and who also participated in a dairy discussion group were seven times more likely to engage in milk recording. Such findings demonstrate the effectiveness of both extension and training programmes geared towards animal health and, in line with previous international research imply that there is an important role for the extension agent, veterinary advisor and other stakeholders in influencing farmer behaviour. The analysis also found that a number of other characteristics of the farm are shown to be significantly associated with reduced SCC at the herd-level, including utilisation of eProfit monitoring, AI breeding techniques and extended grazing season.
- A further element of the research involved the identification of farm-level drivers and barriers to the adoption of *'best practice'* with regard to mastitis and breeding management using both quantitative (NFS survey) and qualitative (focus group) data collection techniques. Results indicate that the economic gain resultant from improved animal health and mastitis control was overwhelmingly recognised by farmers. Interestingly, almost three-quarters reported that they had learned from previous experience with the disease and had subsequently changed their management practices. In line with the international literature the *'stick'* is found to be better than the *'carrot'* in incentivising farmers to improve animal health, i.e., in this instance, farmers report that a penalty imposed on milk with a high SCC is more effective than a bonus offered for milk with a lower cell count. Regression analysis indicated that those farmers who reported good awareness of the link between animal health and profit and had adequate knowledge of mastitis management techniques, were more likely to undertake practices such as milk recording and separating high cell count cows from the rest of the herd during milking. Conversely, the relationship between farmers' attitudes to animal health and their actual behaviour with regard to hygiene related practices such as wearing of gloves and teat cleaning was not as clear. As a result, a number of interesting issues arise in identifying barriers to the uptake of *'best practice'* in this regard. These include the possibility of *'routine inertia'*, i.e., perhaps farmers tend not to deviate from the routine developed around mastitis prevention until there is an indication of infection. To this end farmer behaviour could be considered as reactionary as opposed to precautionary. This finding was also reflected in information garnered through the focus groups undertaken to complement the survey analysis. However, it should be noted that despite this, based on discussions at the focus groups there is a certain amount of *'routine creep'*, where farmers adjust what they do in response to what is accepted as *'best practice'* among their discussion group, for example. To this end, the importance of *'learning by sharing'* through such fora has been validated in this analysis. The qualitative component of this research confirmed that in managing their farms, farmers are making decisions about the particular bundles of technologies and practices they use, on the basis of various trade-offs in terms of time implications, convenience, effort, impact on overall farm profitability, what has worked in the past, and what is considered the norm in terms of their peers. These decisions are made in a context of uncertainty and downstream supply chain signals and incentives, and the current situation in terms of health status on their farms.
- This research provided insights and recommendations for the effective communication of knowledge transfer. Based on this work, it is clear that the perceived usefulness and perceived ease of use of technologies and practices around animal health are important summary ideas for understanding technology and practice implementation for both disease prevention and intervention. The analysis indicates that farm-level routines change over time, in response to trial and error, learning and critical events. To this end the importance of results driven knowledge exchange and the facilitation of farmer *'learning by sharing'* has been highlighted. Understanding the process by which farmers recalibrate their management strategy, and the intervention points around which this is likely to happen, is essential in order to provide appropriately timed and configured knowledge transfer support. In addition, acknowledgement of the importance of farm structural factors and the individual needs of the farmer is critical. The complexity of communication in this regard is

recognised. Furthermore, aligning knowledge transfer with industry is also essential for the continued sustainable growth of the agricultural sector.

5. Opportunity/Benefit:

The undertaking of this type of research is important given that improvements in animal health, breeding and milk quality are essential if the Irish dairy industry is to grow sustainably and retain a competitive advantage in a post-quota environment, most especially in the manufacture of high value dairy products. From a consumer perspective, superior animal health results in enhanced animal welfare, improved food safety and better product quality. In addition, this research has demonstrated that improvements in productivity and profitability are beneficial to both producers and processors. In order to reduce the costs of disease and to improve best practice it is important to demonstrate the economic gains achievable from improved dairy herd health. Results from the analysis underline the importance of herd management factors in improving animal health at the farm-level. This is an important finding since it suggests that farmer behaviour is as, or more, important in controlling animal health performance than physical infrastructure, implying an important role for the extension agent and herd veterinary advisor amongst others. The results are highly relevant for stakeholders and for the design of future policy in this area.

6. Dissemination:

Main publications:

Dillon, E.J., Hennessy, T. and Cullinan, J. (2015). Measuring the economic impact of improved control of subclinical mastitis in Irish dairy herds. *The Journal of Agricultural Science*. DOI:10.1017/S0021859614001178

Dillon, E.J., Hennessy, T. and Cullinan, J. (Forthcoming). Examining the role of agricultural education and extension in influencing best practice for managing mastitis. *The Journal of Agricultural Education and Extension*.

Geary, U., Lopez-Villalobos, O'Brien, B., Garrick, D.J. and Shalloo, L. (2014). Estimating the impact of somatic cell count on the value of milk utilising parameters obtained from the published literature. *Journal of Dairy Research*, Vol. 18.

Geary, U., Lopez-Villalobos, O'Brien, B., Garrick, D.J. and Shalloo, L. (2013). Examining the impact of mastitis on the profitability of the Irish dairy industry. *Irish Journal of Agricultural and Food Research* Vol. 52.

Geary, U., Lopez-Villalobos, N., Begley, N., McCoy, F., O'Brien, B., O'Grady, L. and Shalloo, L. (2012). Estimating the effect of mastitis on the profitability of Irish dairy farms. *Journal of Dairy Science*, Vol. 95.

Popular publications:

Dillon, E.J., Hennessy, T., Cullinan, J. and Heanue, K. (2015). The Economics of Milk Quality. *T Research*, Vol. 10, No.1, Spring 2015.

Geary, U., Shalloo, L., O'Brien, B., McCoy, F. and O'Grady, L. (2011). Mastitis and farm profitability. *TResearch*, Vol. 6, No. 4, Winter 2011.

Conference presentations:

Dillon, E.J. & Hennessy, T. "Measuring the impact of improved animal health practices on the economic efficiency of Irish dairy farms" presented at the 87th Annual Conference of the Agricultural Economics Society, University of Warwick, United Kingdom, April 8th-10th 2013.

Geary, U., O'Brien, B. and Shalloo, L. "Examining the impact of mastitis on the profitability of the Irish dairy industry." Presentation at the Animal Health Ireland Conference, Cork, 23rd October 2013.

7. Compiled by: Emma Dillon and Thia Hennessy.