Institution: University of Bristol

Unit of Assessment: UoA6 – Agriculture, Veterinary and Food Science

Title of case study: Improved dairy-cattle welfare and reduced financial losses result from Bristol research into lameness

1. Summary of the impact (indicative maximum 100 words)

Dairy-cow herds in the UK and overseas, together with the dairy farming industry, are benefiting from strategic animal-husbandry changes and lameness-control programmes underpinned by research undertaken at the University of Bristol since 1997. The dissemination by the UK Dairy Levy Board of national **Standardised Lameness Scores** (the DairyCo Mobility Scoring system, launched in 2008) and of **Husbandry Advisory Tools** (the DairyCo Healthy Feet Programme, launched in 2011) was a direct result of Bristol's work. It has led to the widespread adoption of lameness scoring as a farm-management tool, the inclusion of lameness assessment within certification schemes and a nationwide network of trained 'mobility mentors'. Where implemented, this advisory support has resulted in a **significant drop in lameness prevalence**, thereby **improving welfare** and **reducing the economic losses** associated with treating and culling lame cows. Successful engagement with industry groups throughout the research process has ensured that scientific outputs have been rapidly implemented within the farming community. This approach has been adopted internationally with the scoring system being used by Europe's largest dairy company and a modified version is also being promoted by the New Zealand dairy industry.

2. Underpinning research (indicative maximum 500 words)

In 1997, the UK government policy advisory body, the Farm Animal Welfare Council (FAWC), stated that 'Lameness in dairy cattle is at an unacceptably high level'.

Research at Bristol initially focused on defining how lameness impacts upon dairy-cow welfare [1]. These studies showed that dairy cattle with a higher **Standardised Lameness Score (SLS)** had a reduced nociceptive threshold that persisted for several weeks despite treatment, indicating that lameness did indeed cause pain. This fundamental science was important in demonstrating to policymakers that lameness was a genuine welfare concern that mattered to the cows, in addition to being a well-defined cause of significant productivity loss associated with reduced milk yield, infertility and early culling.

BBRSC-funded experimental studies [i,ii] on the University of Bristol farm then showed that housing system, diet and calving had a strong influence on the prevalence of observable claw horn lesions [2]. More detailed examination of the connective tissues of hooves demonstrated that husbandry issues were associated with significant biochemical, mechanical and histological changes around the time of calving [3]. The panel of experts evaluating the BBSRC Responsive Mode Portfolio in March 2008 identified that the initial BBSRC funding had led to '*very good research outputs and made direct contributions to the public good'*. The husbandry risk factors contributing to lameness prevalence were then examined in over 200 UK dairy herds in the winter of 2006/7. This study demonstrated a mean prevalence of 37% [4].

Using the knowledge generated in these experimental and epidemiological studies undertaken at the University of Bristol and other institutions, a concerted effort was made by Bristol researchers to develop **Husbandry Advisory Tools (HATS)** in the form of farm-specific solutions for farm-specific problems. In an initial investigation by Bristol [iii], lameness was shown to be lower on those farms that adopted the husbandry advice described in these management tools, although the level of compliance by farmers was generally low [5]. Therefore, the next critical step for Bristol and the industry was to design and evaluate alternative motivational strategies to encourage improvements in lameness control. Application of facilitation and social marketing techniques was shown to have significant potential to reduce lameness [6]. This 'Healthy Feet Project' [iv] was undertaken in close collaboration with four dairy companies, two certification schemes and the UK Dairy Levy Board (DairyCo).

The evidence base arising from Bristol highlighting the extent and severity of the welfare concern, the identification of potential husbandry solutions and the benefits of intervention, has provided a solid foundation for the use of **Standardised Lameness Scores** and **Husbandry Advisory Tools** throughout the UK and internationally.

The substantial dairy-cattle lameness research at the University of Bristol Veterinary School has involved the following key researchers: John Webster (Lecturer 1977 to Professor 2008); John Tarlton (Research Fellow 1999 to Senior Research Fellow current); Toby Knowles (Research Associate 1990 to Professor current), Becky Whay (PhD student, 1994-1996; Research Associate 2000 to Senior Lecturer current) and David Main (PhD student 1993-1997; Research Associate 1999 to Professor current).

3. References to the research (indicative maximum of six references)

[1] Whay H.R., Waterman, A.E. & Webster, A.J.F. (1997) Associations between locomotion, claw lesions and nociceptive threshold in dairy heifers during the peri-partum period. Veterinary Journal. 154: 155-161. http://dx.doi.org/10.1016/S1090-0233(97)80053-6

[2] Webster, A.J.F. (2002) Effects of housing practices on the development of foot lesions in dairy heifers in early lactation. Veterinary Record. 151: 9-12. doi:10.1136/vr.151.1.9

[3] Tarlton, J.F., Holah, D.E., Evans, K.M., Jones, S., Pearson, G.R. & Webster, A.J.F. (2002) Biomechanical and histopathological changes in the support structures of bovine hooves around the time of first calving. Veterinary Journal. 163: 196-204. http://dx.doi.org/10.1053/tvjl.2001.0651

[4] Barker, Z.E., Leach, K.A., Whay, H.R., Bell, N.J. & Main D.C.J. (2010) Assessment of lameness prevalence and associated risk factors in dairy herds in England and Wales. Journal of Dairy Science. 93: 932-941. http://dx.doi.org/10.3168/jds.2009-2309

[5] Bell, N.J., Bell, M.J., Knowles, T.G., Whay, H.R., Main, D.C.J. & Webster, A.J.F. (2009) The development, implementation and testing of a lameness control programme based on HACCP principles and designed for heifers on dairy farms. Veterinary Journal. 180: 178-188. http://dx.doi.org/10.1016/j.tvjl.2008.05.020

[6] Main, D.C.J., Leach, K.A., Barker, Z. E., Sedgwick, A.K., Maggs, C.M., Bell, N.J. & Whay, H.R. (2012) Evaluating an intervention to reduce lameness in dairy cattle. Journal of Dairy Science. 95: 2946-2954. http://dx.doi.org/10.3168/jds.2011-4678

Grants

[i] 1998-2000 BBSRC. £68,265. Webster, A.J.F. Cattle lameness at calving, a hypothesis involving metabolism of the collagenous tissues supporting the foot.

[ii] 2002-2005 BBSRC. £282,148. Tarlton, J. Metabolic and pathogenic mechanisms of loss in supportive capacity of bovine hooves at calving leading to lameness.

[iii] 2002-2007 DEFRA. £492,732. Webster, A.J.F. Alleviation of lameness in dairy heifers: development of a lameness control plan.

[iv] 2005-2010 TUBNEY CHARITABLE TRUST. £648,000, Main, D.C.J. Reducing lameness in dairy cattle by implementing existing knowledge: Healthy Feet Project.

4. Details of the impact (indicative maximum 750 words)

Research findings from Bristol on dairy cattle lameness have been adopted by dairy industries in UK, Europe and New Zealand. The implementation of this research in the UK has been primarily due to the active involvement of DairyCo, which is the levy-funded, not-for-profit organisation working on behalf of Britain's dairy farmers. The organisation has an annual budget of over £4 million for research and knowledge transfer to address 'market failure' issues in the dairy industry (i.e. to tackle issues not currently being dealt with adequately to meet the needs of the industry). DairyCo's animal-health knowledge-transfer programme had previously focused on nutrition, genetics and mastitis programmes. However, in 2010 an industry collaboration led by the National Farmers Union published a Dairy Cow Welfare strategy [a] that listed 'improvement in the

recognition, treatment, prevention and control of lameness' as a key industry priority. This specific priority was reviewed in September 2011 by the Cattle Health and Welfare Group, which is responsible for implementing Defra's GB Animal Health and Welfare Strategy. They reported that '*DairyCo has undertaken to progress the valuable work initially completed by Bristol University Veterinary Faculty and funded by the Tubney Charitable Trust on dairy cow mobility*' [b]. The DairyCo dissemination materials have since been adopted by European dairy companies and the New Zealand dairy industry. The Bristol research has had impact in the following two main areas; Standardised Lameness Scores and Husbandry Advisory Tools.

a) In 2008, DairyCo launched the DairyCo Mobility Score, which was based on Bristol's **Standardised Lameness Score** [c]. This was followed by a proactive DairyCo knowledge-transfer programme, aimed at farmers and their advisors, which has included the distribution of 7,000 professionally produced DVDs, SLS scoring pads and laminated scoring cards and 5,000 lesion-recognition cards. The SLS scoring system has been widely adopted as a management tool on UK dairy farms. In a recent consultation exercise undertaken by the industry's Red Tractor Assurance Scheme, 39% of farmers reported that they carried out SLS scoring at least every three months [d]. An important driver has been the involvement of major retailers: in 2011, *Farmers Weekly* [e] reported that the scoring system was being used by Tesco, McDonald's, Sainsbury's, Morrisons, Asda and Waitrose.

An important developing impact has been the inclusion of the DairyCo Mobility Score within the Red Tractor Dairy Assurance Scheme from 2013 [f]. The scheme, which is supported by the major retailers, certifies over 90% of UK dairy production. The pilot testing of this work was supported by the AssureWel project (www.assurewel.org) a collaboration between Bristol University, the RSPCA and the Soil Association. The inclusion of the SLS scoring system within this assurance scheme means that the industry can now prioritise support for those farms that have the highest levels of lameness. This provides a powerful new mechanism for improving the welfare of the approximately two million dairy cattle in the UK.

The scoring system also features in **Danone's Dairy Animal Welfare Programme** [g]. Danone (Europe's largest dairy company) is promoting use of this animal welfare programme to over 27,000 farms via its Sourcing and Supplier Development department. The scoring system has also been adapted for use in New Zealand which is a major dairy producer with over 11,000 farms and 4.5 million cows. The **DairyNZ Healthy Hoof Lameness Scoring** [h] is now being actively promoted to all New Zealand dairy producers.

b) Bristol research on **Husbandry Advisory Tools** has also had a major impact on husbandry practices on farms. Between 2005 and 2009, the first large-scale application of the approach was an intervention project, the **Healthy Feet Project** [6], led by Bristol and involving over 200 farms. This demonstrated that implementation of the husbandry advice within the programme reduced lameness in 73% of farms over the three-year monitoring period, and that 52% of farms reduced lameness by more than 10%. Subsequently, an EU-supported Rural Development Programme in England (RDPE) supported the roll-out of this lameness advice to the South West [i]. The £5 million fund to support ruminant health and welfare in the region has involved 13 veterinary practices and, as of April 2013, 383 herds had been recruited onto the programme. Of the initial 38 herds completing all stages of the support package, 28 had a mean 6.2% reduction in lame animals. Other regions have also now adopted the approach with lameness-related RDPE support. The support for the DairyCo Healthy Feet Programme in the North West region is being evaluated. Initial findings are very positive [j], showing that the programme has stimulated farmers to undertake twice as many interventions to reduce lameness as farmers not enrolled in the programme (7.9 vs 3.8 interventions per farm).

At a national level, the DairyCo Healthy Feet Programme [k] was launched in 2011. In its 2012 annual report, DairyCo [l] described the programme as follows: "*Based on proven research, the DairyCo Healthy Feet Programme brings together the skills of vets, farmers and advisors, in a structured approach to identify and tackle lameness on-farm, supported by a comprehensive range of technical materials including foot care and foot health recognition guides. Trained 'mobility mentors' create and deliver customised programmes culminating in a 'mobility contract', which sets*

out a timescale and actions to reduce the risk of lameness in the participating herd." This has led to a national roll-out with a network of approximately 100 trained 'mobility mentors', including veterinarians and members of the National Association of Cattle Foot Trimmers, who are available to provide support to UK dairy farmers. Bristol's influential role has been recognised within the veterinary community: e.g. the University hosted the International Conference in Lameness in Ruminants in August 2013.

In conclusion, Bristol's research has had a **major impact on lameness in dairy cattle** in the UK and internationally. In addition to the **direct welfare benefits** to the cows, reducing lameness also has positive effects of the profitability of dairy farms. In a review of the **financial impact** of lameness on the UK dairy industry in 2009 [m] the estimated annual cost of the lameness to the typical herd was found to be £7,500, and £125 million to the industry. There is therefore a significant opportunity to increase profitability and welfare for those farms that adopt the University of Bristol research. This is the critical justification for the pro-active support for the knowledge transfer programme provided by DairyCo, the National Dairy Levy Board.

5. Sources to corroborate the impact (indicative maximum of 10 references)

[a] NFU Dairy Cow Welfare Strategy (2010) http://www.eblex.org.uk/documents/content/returns/chawg_dairy_cow_welfare_report_2010.pdf *(UK Dairy industry priorities for health and welfare which includes lameness)*

b] The Dairy Cow Welfare Strategy – Year 1 Progress Against Targets Report (2011) http://www.dairyco.org.uk/technical-information/animal-health-welfare/dairy-cow-welfare-strategy/ *(Reported actions in response to strategy)*

[c] DairyCo Mobility score (2008) http://www.dairyco.org.uk/technical-information/animal-health-welfare/lameness/husbandry-prevention/mobility-scoring/ *(Agreed national scoring system based on Bristol research)*

[d] Response to Red Tractor Assurance Scheme consultation exercise (2012) *(Consultation reporting extensive use of lameness scoring)*

[e] Focus on Mobility to Stamp Out Lameness. Farmers Weekly (2011) http://www.fwi.co.uk/Articles/2011/03/11/125834/VIDEO-Focus-on-mobility-to-stamp-out-lameness.htm *(Reports of retailers requiring lameness scoring)*

[f] The Finalised Changes to the Scheme. Red Tractor Assurance Scheme (2013) http://assurance.redtractor.org.uk/rtassurance/farm/dairy/news/welfare_outcomes.eb *(Industry assurance scheme requiring formal lameness scoring)*

[g] Danone's 'Dairy Animal Welfare Programme' page 38 *(Large European dairy company recommending lameness scoring)*

[h] DairyNZ Healthy Hoof Lameness Scoring (2013) http://www.dairynz.co.nz/page/pageid/2145876673/Lameness_Scoring *(New Zealand industry organisation recommending scoring based on DairyCo score)*

[i] South West Healthy Livestock initiative (2013) Data on file. Research Fellow, University of Bristol, personal communication *(Reported uptake of Bristol developed husbandry advise tools in SW region)*

[j] Atkinson, OCD & Fisher, G.E.J. (2013) Uptake and delivery of a lameness reduction programme in North West England: preliminary findings. International lameness conference *(Effect of husbandry advise tool on farmer behaviour)*

[k] DairyCo Healthy Feet Programme (2011) http://www.dairyco.org.uk/farming-info-centre/healthy-feet-programme.aspx *(National launch of husbandry advisory tool)*

[l] DairyCo Progress. Our Annual Report (2012) http://www.dairyco.org.uk/resources-library/about-dairyco/annual-reports/progress2012/ *(Report of advisory tool roll out)*

[m] An Economic Review of Cattle Lameness (2009) Willshire JA & Bell NJ. Cattle Practice. 17: 136-141. http://www.bcva.eu/bcva/sites/default/files/cpd_documents/17_136.pdf *(Economic impact of lameness control)*