Institution: University of Bristol

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

Title of case study: Welfare of millions of laying hens across Europe transformed by the introduction of enriched cages

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

Hundreds of millions of laying hens in the European Community are now kept in enriched cages with significantly more space than conventional battery cages and with specific provision for nesting, scratching and perching. Research undertaken at Bristol University provided much of the evidence base for the full implementation of the relevant European directive in January 2012; the prohibition of the conventional battery cage and the introduction of a superior, scientifically researched alternative. This has had a **dramatic impact on husbandry standards and the welfare of laying hens**. With Bristol's involvement, similar progress has also been made in countries beyond Europe.

2. Underpinning research (indicative maximum 500 words)

Although evidence had accumulated that the conventional battery cage did not meet the behavioural needs of laying hens, in 1993 there remained considerable scientific uncertainty about both the optimal design and the welfare benefits of an alternative, enriched cage.

In work that was completed in 1994, the University of Bristol designed and commissioned the manufacture of three different designs of prototype cage. These were built by a small, UK manufacturing company (Patchetts) and installed at Bristol's School of Veterinary Science. The behaviour and welfare of hens kept in the cages was then monitored. The work was funded by the Ministry of Agriculture, Fisheries and Food [i] and provided vital early information about how nests could be incorporated within a cage system to ensure bird welfare and to minimise any adverse effects on production (e.g., birds laying eggs on the cage floor) [1, 2]. Groups in Edinburgh and Sweden also pilot-tested some of these early cage designs.

Bristol was then commissioned in 1997 by the Ministry of Agriculture, Fisheries and Food (MAFF) to investigate whether dust baths could be included within furnished cages and to identify the consequences for hen welfare of different design solutions [ii]. This study showed that the provision of full dust baths in a furnished cage was *not* a practical proposition. However, hens were able to perform a certain degree of dust bathing in the nest areas, partially satisfying this behavioural need [3]. Other Bristol research showed that cage design influenced the potential for birds to step on, and therefore damage, each other's backs [4].

In 2000, MAFF also agreed to fund a series of commercial-scale trials as, at that stage, the industry was reluctant to invest in new cage systems. The trials explored the welfare impact of various cage heights, stocking density, and floor types that could promote foraging and dustbathing. The grant [iii] was awarded to a collaborative group including the University of Bristol, the University of Edinburgh and de Montfort University. Bristol researchers were specifically responsible for monitoring the behaviour of the birds in commercial cages based at the former husbandry trial facility, ADAS Gleadthorpe. Three designs of furnished cage, based upon early prototypes developed by Bristol and Edinburgh researchers, were compared with conventional battery cages. The study showed that basic and essential behavioural needs were satisfied in the enriched cages and that, contrary to industry concerns, mortality in enriched cages was no higher than in conventional cages [5]. University of Bristol work on the enriched cage design continued on a commercial scale in collaboration with ADAS. This work also showed that certain cage-floor designs increased dust-bathing behaviour.

In 2004, Department for Environment, Food and Rural Affairs (Defra) [iv] commissioned the University of Bristol to conduct a fair and direct comparison of the welfare of birds in all current cage systems to *"inform the UK position in European negotiations".* This work showed that many aspects of welfare were superior in furnished cages compared with other systems [6].

Work at Bristol on laying hens has been led by Professor Christine Nicol (Lecturer 1985-1993, Reader 1994-2001, Professor 2001 - present). Also involved in the work were postdoctoral researchers Chris Sherwin (1990-2010), Claire Weeks (Research Fellow 2004-2010, Senior Research Fellow, 2010-present), Cecilia Lindberg (1995-2003), Raf Freire (1996-2001), and PhD student Ralph Merrill (2000-2004).

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

[1] Sherwin, C.M. and Nicol, C.J. (1993) Factors influencing floor laying by hens in modified cages. Applied Animal Behaviour Science. 36: 211-222. http://dx.doi.org/10.1016/0168-1591(93)90011-D

[2] Sherwin, C.M. and Nicol, C.J. (1994) Dichotomy in choice of nest characteristics by caged laying hens. Animal Welfare. 3: 313-320. http://www.ingentaconnect.com/content/ufaw/aw/1994/00000003/00000004/art00006

[3] Lindberg, A.C. and Nicol, C.J. (1997) Dustbathing behaviour by hens in modified cages. Is sham dustbathing an adequate substitute? Applied Animal Behaviour Science. 55: 113-128. http://dx.doi.org/10.1016/S0168-1591(97)00030-0

[4] Freire, R., Walker, A., and Nicol, C.J. (1999) The relationship between trough height, feather cover and behaviour of laying hens in modified cages. Applied Animal Behaviour Science. 63: 55 – 64. http://dx.doi.org/10.1016/S0168-1591(98)00244-5

[5] Appleby, M.C., Walker, A.W., Nicol, C.J., Lindberg, A.C., Freire, R., Hughes, B.O. and Elson, H.A. (2002). Development of furnished cages for laying hens. British Poultry Science. 43: 489-500. DOI : 10.1080/0007166022000004390

[6] Sherwin, C.M., Richards, G. and Nicol, C.J. (2010) A comparison of the welfare of layer hens in four housing systems used in the UK. British Poultry Science 51: 488-499. DOI:10.1080/00071668.2010.502518

Grants:

[i] 1990-1993 MAFF. £98,000. Nicol, C. The design of a welfare-improved cage for laying hens

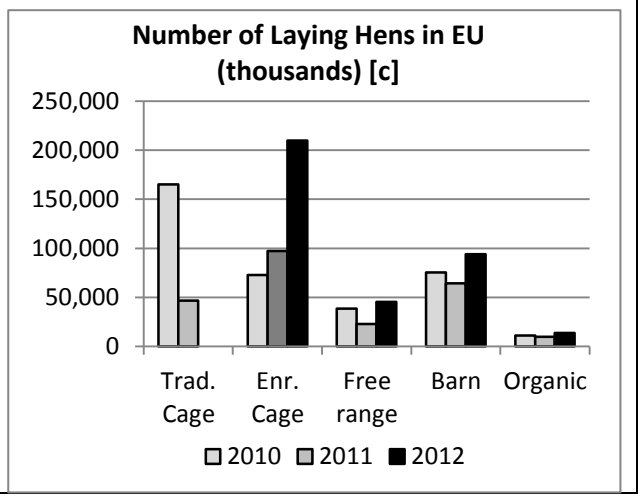
[ii] 1997-2000 MAFF. £151,363. Nicol, C. Importance of dustbathing in laying hens – is there a need to perform this behaviour?

[iii] 2000-2004 DEFRA (replaced MAFF in 2001). £616,384. Nicol, C. Effects of stocking density, cage height on health, behaviour, physiology & production of laying hens in enriched cages

[iv] 2004-2007 DEFRA. £295,265. Nicol, C. A comparative study to assess the welfare of laying hens in current housing systems

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

The **content and implementation** of European directive 1999/74/EC in January 2012 [a] which prohibits the use of conventional battery cages for laying hens and introduces replacement, enriched cages, has had a **major impact on chicken welfare**, and was significantly influenced by Bristol University research. Cages, which previously only required 450 cm^2 per bird, now require 750 cm^2 per bird, with specific provision for nest, litter and perches.



A critical milestone, necessary for the implementation of this directive, was the formal decision by the European Commission in 2008 to go ahead with the battery-cage ban [b]. This decision was also influenced by Bristol research, and was made despite significant resistance from

the poultry industry and national governments across Europe. Following this decision, and in anticipation of the directive implementation, producers changed how they house their laying hens. Prior to 2008 enriched cages were extremely unusual. The directive led to a rapid change between 2010 and 2012 (see figure). The number of hens in the EU reported to be in traditional cages was 165 million birds in 2010 (32% of EU production). However, **after the traditional cage was banned the number of hens in enriched cages was reported to be 210 million birds in 2012 (42% of EU production).** University of Bristol research directly contributed to this major impact on production systems and animal welfare. The original European directive, 1999/74/EC, was drafted following the publication of the 1996 Opinion of the EC Scientific Veterinary Committee [d]. The report cited the role of Bristol in developing enriched cages in research published after 1993 [1,2]. This research was critical in demonstrating the potential welfare benefits of enriched cages.

However, some uncertainty remained about these welfare benefits. The Commission was required to undertake a review of the implementation of the directive, taking into account the "pathological, zootechnical, physiological, and ethological aspects of the various systems and of their health and environmental impact". The review which was completed in 2008, was regarded by many as an opportunity to delay or even prevent implementation of the proposed ban on traditional cages.

Even though welfare charities continued to argue that all types of cage should be banned [e], previous scientific uncertainty about the welfare benefits and optimum design of the enriched / modified cage was highlighted by the industry. In particular the industry suggested that mortality would be higher if space allowances were increased and that the complex modified cage would reduce productivity and egg quality. The industry standpoint in most EU countries was that insufficient evidence was available for an acceptable alternative to the conventional cage. A consortium representing egg producers throughout Europe presented a paper to the Commission in 2007 seeking to extend the phase-out deadline from 2012 to 2017 [f].

Hence the research on the welfare impact of enriched cages was crucial to inform the Commission Review. The scientific evidence was collated in two critical reports. Firstly EFSA (European Food Safety Authority) considered the relevant evidence [g], including 13 publications from Bristol. Professor Nicol was one of the 10 members from the EU to sit on the scientific advisory group. Secondly, an EU-funded collaborative project (LayWel) involving eight institutions, also including Bristol, examined the welfare implications of different husbandry systems [h].

In 2008, after reviewing the scientific evidence within the EFSA opinion and the LayWel report, the **European Commission was satisfied that the science did justify the proposed ban on the conventional cage**. The report from the Commission stated that *"Enriched cages improve the welfare of the animals in comparison with unenriched cage systems and further optimisation seems possible in the future. In contrast, the unenriched cages cause several animal welfare problems that are inherent to the systems".* [b]

Hence Bristol research on the welfare of laying hens contributed both to the content of the original directive and to the decision taken by the Commission in 2008 to implement that directive. This led directly to a **dramatic change in the husbandry standards for millions of laying hens** as described in the opening paragraph.

In April 2013, the European Enforcement Network of animal welfare lawyers and commissioners reported that all countries except Italy and Greece have complied with the requirements for enriched cages [i]. The change in requirements for cages and the increase in consumer awareness of laying-hen welfare standards have also led to a reduction in the overall proportion of hens reared in any cage (reduction from 74% to 65% in 2010).

Bristol research on enriched cages has, therefore, had a major impact on the welfare of laying hens throughout Europe. It is clear that this research has also had a **major international influence**. Professor Nicol was funded by the New Zealand Egg Producers' Association in 2009 to give a lecture tour explaining the reasoning and process behind the EU ban. She also acted as a consultant in the only commercial trial of enriched cages in New Zealand. From 2012, no new conventional cages can be installed in New Zealand, but enriched cages will be permitted, as in Europe [j]. Perhaps most surprisingly, despite very limited existing US federal animal welfare law, legislation is currently being drafted based on an historic agreement between producer

organisation United Egg Producers and The Humane Society of the United States [k]. The scientific justification for this agreement was based on a review of which Nicol was a co-author and a report from the HSUS which also makes extensive reference to University of Bristol plus the EFSA and Laywel reports. The state of California has decided to ban cages from 2015 [l]. Tasmania was the first Australian state to declare phase-out, with no new battery cages allowed from 2012 in Australia [m].

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

[a] COUNCIL DIRECTIVE 1999/74/EC of 19 July 1999 laying down minimum standards for the protection of laying hens. L 203/54 EN Official Journal of the European Communities *(EU legislation banning traditional battery cage in 2012)*

[b] Communication from the commission to the European Parliament and the Council on the various systems of rearing laying hens, in particular those covered by Directive 1999/74/EC {SEC(2007) 1750}(2008) http://ec.europa.eu/food/animal/welfare /farm/laying_hens_en.htm *(Decision to implement the directive in full following a formal review of evidence)*

[c] Laying hens by way of keeping (2013) European Egg Producers Association. http://www.eepa.info/Statistics.aspx *(Numbers of birds kept in different systems)*

[d] 1996 EC Scientific Veterinary Committee Report on the Welfare of Laying Hens http://ec.europa.eu/food/fs/sc/oldcomm4/out33_en.pdf *(Original report, including Bristol research, recommending ban on conventional cages in 2012)*

[e] Laid Bare....the case against enriched cages in Europe. Compassion in World Farming (2002) http://ciwf.org.uk/includes/documents/cm_docs/2008/l/laid_bare_2002.pdf *(Welfare charities support for complete cage ban in 2012)*

[f] EUWEP, representative body in the European Union for egg packers, egg traders and egg processors, and poultry and game. http://www.euwep.info/page3.htm *(Industry pressure to delay ban on any cage in 2012)*

[g] Blokhuis, H., Cepero, R., Colin, P., Elson, A, Fiks van Niekerk, T., Keeling, L., Michel, V., Nicol, C.J., Oester, H. and Tauson, R. (2005). Welfare Aspects of Various Systems of Keeping Laying Hens. European Food Safety Authority Journal 197: 1- 23. *(Summary of scientific evidence used by Commision to justify implementation of conventional cage ban in 2012)*

[h] Blokhuis, H.J., van Niekerk, T., Bessei, W., Elson, A., Guemene, D., Kjaer, J., Levrino, G., Nicol, C.J., Tauson, R., Weeks, C.A. and van de Weerd, H. (2007). The LayWel project: welfare implications of changes in production systems for laying hens. World's Poultry Science Journal. 63: 103-116. *(Evidence used by Commision to justify implementation of ban in 2012)*

[i] The European Enforcement Network of animal welfare lawyers and commissioners (2013) http://lawyersforanimalprotection.eu/ongoing-enforcement-activities-and-challenges/cage-ban-laying-hens/ *(Report on compliance with directive)*

[j] http://www.biosecurity.govt.nz/media/06-12-2012/layer-hen-cages-phased-out (2012) *(New Zealand policy supporting enriched cages)*

[k] Details of the Animal Welfare Agreement between The Humane Society of the United States and The United Egg Producers (2012) http://www.humanesociety.org/assets/pdfs/farm/battery_cage_agreement_fact.pdf *(US policy supporting enriched cages*)

[l] California ban on battery cage (2013) http://en.wikipedia.org/wiki/California_Proposition_2_%282008%29

[m] Tasmania phase out of battery cage (2012) http://www.premier.tas.gov.au/budget_2012-13/growing_industry_and_improving_animal_welfare