Institution: The University of Edinburgh

Unit of Assessment: UoA5: Biological Sciences

Title of case study:

07. Welfare of laying hens is improved by a ban on battery cages

1. Summary of the impact

Impact on health and welfare: The health and welfare of laying hens has been improved by the EU-wide ban on the use of small, barren battery cages, enabled by UoE research on the relationship between cage design and welfare.

Impact on public policy and services: The EU banned conventional battery cages for laying hens through a directive that came into effect on 1st January 2012. New Zealand followed with its own ban in 2012.

Impact on production: Farmers have changed from housing laying hens in battery cages to using more welfare-friendly furnished cages or free-range systems.

Impact on commerce: In the UK, over £400M has been spent to meet the standards laid down by the EU directive.

Beneficiaries: Laying hens in Europe and New Zealand; farmers who use furnished cages as an economically efficient alternative to free-range.

Significance and Reach: The improved welfare of over 1.3 billion laying hens in Europe and New Zealand.

Attribution: All research was led by Dr Michael Appleby, University of Edinburgh (1984-2001), with collaborators at the Roslin Institute (now UoE), Uppsala and Bristol.

2. Underpinning research

UoE research led by Dr Mike Appleby investigated the welfare of laying hens in commercial egg farming, comparing different types of cages, free-range and deep litter systems. His work with Hughes and Smith of the Roslin Institute (now also UoE), published in 1993 [1], focused on the effect of modified cages holding small groups of hens on hen behaviour and welfare. This research adopted a stage-by-stage, systematic approach to the design of modified cages. Recommendations for cages delivering improved welfare arising from this research included increased area and height compared to conventional cages, and inclusion of a perch, a nest box and a dust bath.

In a 1993 review paper (Animal Welfare, 1993, 2; 67-80), Appleby argued that in the current state of development of alternative systems, modifying cages for laying hens could on balance be more beneficial to the welfare of hens than banning cages completely. Legislation to specify the facilities which should be provided for laying hens would address the main welfare issues, thereby banning battery cages but not furnished cages.

Subsequent work [2] described further behavioural, welfare and production studies which trialled the Edinburgh Modified Cage (EMC), a novel 'enriched' cage design housing a perch, nest box and dustbath, with the latter two being controlled automatically. EMC was 600 mm wide, 450 mm deep and 450 mm high at the rear; it had a softwood perch and at one side a 250 mm wide nest box (containing litter or artificial turf) with a dust bath directly above. It housed 4 birds and provided 675 $cm^{2/}$bird in the main cage with an additional 281 cm^2 /bird in the nest box. The UoE researchers showed that hens performed natural pre-laying behaviour in the cages with nest boxes, preferentially laid within the next box (96% of layings), and that the dust baths were used well, with three times as many hens performing bathing behaviours compared to the control group. 98% of hens roosted on the perch overnight.

Paper [3] in collaboration with Tauson (Swedish University of Agricultural Sciences) showed that modified enriched cages were commercially viable. In 1996 [4], UoE research showed through

trials of more than 3500 hens that the behaviour and health of hens were improved in the modified cages compared either to conventional battery cages or to large 'get away' cages housing 16-20 hens which were then perceived to offer a more 'natural' environment.

Appleby published further work on the Edinburgh Modified Cage regarding group size and space allowance in 1998 [5]. It showed that the hens used the facilities well, they had settled nesting behaviour that is a good welfare sign, and their condition was improved compared to those hens in conventional cages. Egg production was above breeders' standards and although egg production would cost more than in conventional battery cages, it was less than the cost of free range.

In 2002 the results of a 3-year trial of furnished cages for laying hens funded by the UK Ministry of Agriculture, Fisheries and Food were published [6]. This study, which was led by Appleby whilst at UoE, took place at the Poultry Research Centre at ADAS Gleadthorpe in collaboration with Hughes and with Nicol (Bristol Veterinary School). The study concluded that behaviour was more unrestricted and varied, and physical condition was better, in furnished than in conventional cages and that furnished cages protected the welfare of laying hens.

People: Dr Michael Appleby (lecturer, UoE) 1984-2001, led all of the research. He is now Chief Scientific Adviser at the World Society for the Protection of Animals (WSPA), London and an honorary fellow at the University of Edinburgh. Key collaborators: Barry Hughes and S Smith, Roslin Institute (UoE); Ragnar Tauson, Uppsala; Christine Nicol, University of Bristol Veterinary School.

3. References to the research

1. Appleby, M.C., Smith, S.F., Hughes, B.O. (1993). Nesting, dust bathing and perching by laying hens in cages: effects of design on behaviour and welfare. *British poultry science*, **34,** 835-847. PubMedID: 8156422
   68 Scopus citations at 19/09/2013.
2. Appleby, M.C. & Hughes, B.O. (1995). The Edinburgh Modified Cage for laying hens. British Poultry Science **36,** 707-718. doi: 10.1080/00071669508417815.
   43 Scopus citations on 19/09/2013.
3. Abrahamsson, P., Tauson, R. & Appleby, M.C. (1995). Performance of four hybrids of laying hens in modified and conventional cages. Acta Agriculturae Scandinavica Section A – Animal Science 45 (4) 286-296. doi:10.1080/09064709509413088
   34 Web of Science citations on 01/10/2013
4. Abrahamsson, P., Tauson, R. & Appleby, M.C. (1996). Behaviour, health and integument of four hybrids of laying hens in modified and conventional cages. British Poultry Science **37**, 521-540. DOI:10.1080/00071669608417882.
   72 Scopus citations on 19/09/2013.
5. Appleby, M.C. (1998). The Edinburgh Modified Cage: effects of group size and space allowance on brown laying hens. Journal of Applied Poultry Research **7**, 152-161. http://japr.fass.org/content/7/2/152.full.pdf+html or available on request
   18 Scopus citations on 19/09/2013.
6. Appleby, M.C., Walker, A.W., Nicol, C.J., Lindberg, A.C., Freire, R., Hughes, B.O. & Elson, H.A. (2002). Development of furnished cages for laying hens. British Poultry Science **43,** 489-500. DOI: 10.1080/0007166022000004390.
   74 Scopus citations on 19/09/2013.

4. Details of the impact

By showing that it is possible to minimise the main disadvantages of cages whilst keeping the advantages, UoE-led research into the design and development of furnished cages has led to an improvement in the welfare of all commercial laying hens in Europe [a,b]. The policy impact of this work started to take effect in 1996 but the main animal welfare (and commercial) impact has been in the period 2008-13, arising from EU legislation banning battery cages which came into effect in 2012.

It is widely accepted that conventional battery cages for housing laying hens cause many welfare problems and they can compromise many or all of the Farm Animal Welfare Council (FAWC 1997) "Five Freedoms": that farm animals should have freedom from hunger and thirst, from discomfort, from pain, injury or disease and from fear and distress, and freedom to express normal behaviour. Battery cages do not even meet the earlier recommendation of the Brambell Report (HMSO, 1965), that an animal should be able without difficulty to stand up, lie down, turn around, groom and stretch their limbs. However, non-cage systems also have welfare issues. UoE research, along with other groups, showed prior to 1993 that free-range and deep litter systems carry with them welfare problems such as cannibalism. To minimise the risk of cannibalism, beak trimming is performed. This is itself a welfare issue.

In 1996, the EU's Scientific Veterinary Committee (Animal Welfare Section) reviewed the welfare of laying hens in cages and reported that "because of its small size and its barrenness, the battery cage as used at present has inherent severe disadvantages for the welfare of hens. To retain the advantages of cages and overcome most of the behavioural deficiencies, *modified enriched cages* [our italics] are showing good potential in relation to both welfare and production" [c]. They also reported on other housing systems "aviaries, percheries, deep litter or free range systems provide … improved possibility for the birds to express a wider range of behaviour patterns ... [However] mainly because of the risk of feather pecking and cannibalism, these systems have severe disadvantages for the welfare of laying hens." This 1996 report directly references the UoE research published since 1993 [1] [3] [4].

Sweden was the first country to introduce furnished cages on a large, commercial scale from 1998; the UoE work was influential in the design of these furnished cages [b]. In late 1998 a number of representatives of the Council of Ministers and the Commission's Directorate-General for Agriculture visited Sweden to see the advantages and disadvantages of furnished cages for themselves. This led to a 1999 directive by the EU, which was strongly based on advice from this Scientific Veterinary Committee [a,b]. In 1999, the EU passed a directive (1999/74/EC) leading to the banning of conventional battery cages because of the welfare issues associated with them and specifying the minimum requirements required for furnished cages. This directive banned conventional battery cages in the EU **with effect from January 1st 2012** after a 13-year phase-out period. As an alternative to battery cages, the directive allowed either non-cage systems or furnished cages. Under the directive, furnished cages must provide at least 750 cm^2 per hen, of which 600 cm^2 is 45 cm high, a nest, a littered area for scratching and pecking, 15 cm of perch and 12 cm of food trough per hen and a claw shortening device [d]. This is a close match to the original Edinburgh Modified Cage design [2, 5]. The Guardian newspaper has described this as "one of the most significant pieces of animal welfare legislation ever passed"

The EU directive was passed despite opposition from the egg industry of Europe and worldwide, mainly due to the increased cost of using systems other than battery cages. A contemporary BBC news article reports that "The European Commission had called for an increase in the size of battery hen cages … But MEPs went a step further and agreed by a two-thirds majority to ban such cages altogether". The availability of the economically-viable furnished cage design derived from UoE research [4, 6], with its proven welfare benefits, enabled the full battery cage ban by providing an economically-viable but high-welfare standard cage, mitigating the economic impact that a ban on any caged system would have had, and making it possible to implement the battery ban without having such an adverse cost impact that it would have become more difficult for the EU to protect its egg industry against competition from the rest of the world. Without the option of the furnished cage, it is probable the battery cage ban would not have been passed into law.

EU-wide there were 240 million laying hens housed in battery cages in 2006, representing 80% of the EU flock [Farm Animal Welfare Council (FAWC) figures]. The number of hens housed in furnished systems has risen during the REF period as a result of the phasing out of battery cages prior to the 2012 implementation date of the ban: from 0% in 2006 to 14.3% (72.8 million) in 2010 and 42.3% (210 million) in 2012 [e]. The number in battery cages has decreased throughout the period: 32.4% (165 million) in 2010; 11.3% (46.5 million) in 2011; 0% in 2012. Other hens are now in barns, free-range or other approved systems. In the UK alone, over £400M has been spent to

meet the standards laid down for the 2012 EU ban. DEFRA figures for 2012 indicate that 48.5% of UK eggs laid come from furnished cages; this compares with 9% in 2009 [FAWC].

New Zealand has also acted to ban battery cages in favour of free range, barn, or enriched-cage systems. The New Zealand government ruled that from 7th December 2012, no new battery cages could be installed in the country.

In 2012 there were approximately 500 million laying hens in the EU, including 34.8 million in the UK [f]. The UoE research has led to the increased welfare of some 1.3 billion laying hens to date throughout Europe in the period January 2008 to July 2013.

5. Sources to corroborate the impact

The Tiny URLs provide a link to archived web content, which should be accessed if the original web content is no longer available.

a) Contact to confirm that UoE research influenced the design and implementation of the EU-wide use of furnished cages: Director, Animal Welfare Unit, European Commission DG Sanco.

b) Contact to confirm that UoE research influenced the design and implementation of the EU-wide use of furnished cages: Inst för HUV, Uppsala.

c) The report of the European Commission, Scientific Veterinary Committee Animal Welfare Section. Report on the welfare of laying hens (1996). Directorate-general for Agriculture VI/BII.2. can be found at: http://tinyurl.com/og77dxy [copy of pdf also available on request]

d) EU 1999/74/EC directive for "Laying down minimum standards for laying hens" http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:203:0053:0057:EN:PDF [copy of pdf also available on request]

e) EU figures for laying hens: http://www.eepa.info/Statistics.aspx (Miscellaneous section/Laying hens by way of keeping) or http://tinyurl.com/qztwe49

f) UK figures for laying hens: https://www.gov.uk/government/publications/egg-statistics or http://tinyurl.com/qf7sxk4