

1 **Farmer attitudes to injurious pecking in laying hens and to potential**  
2 **control strategies**

3  
4 **<sup>1</sup>Palczynski LJ, <sup>2</sup>Buller H, <sup>1</sup>Lambton SL and \*<sup>1</sup>Weeks CA**

5  
6 <sup>1</sup>Animal Welfare and Behaviour Group, University of Bristol, School of Veterinary Sciences, Langford,  
7 Bristol BS40 5DU, UK

8 <sup>2</sup>Geography, College of Life and Environmental Sciences, University of Exeter, Rennes Drive, Exeter, EX4  
9 4RJ UK

10  
11 \* Corresponding author

12 Tel: 0117 9289316

13 [claire.weeks@bristol.ac.uk](mailto:claire.weeks@bristol.ac.uk)

14  
15  
16  
17  
18 **Running title: Attitudes to injurious pecking**

19  
20 **Abstract**

21  
22 Farmers' recognition of health and welfare problems, and their responses to related intervention programmes  
23 such as those to reduce injurious pecking (IP) in hens, directly influence the welfare of animals in their care.  
24 Changing those responses can be achieved through a re-positioning of social drivers as well as from individual  
25 behaviour. This study begins by considering how certain levels of plumage damage become normalised while  
26 others might be considered unacceptable. Drawing upon in-depth farmer interviews, the study investigates  
27 how management practices for addressing the issue of IP are developed and enacted, looking at the relative

28 influence of intrinsic and extrinsic individual behavioural factors. Twelve farmers with varied uptake of  
29 evidence-based management strategies designed to reduce levels of IP were interviewed. Although farmers  
30 ranked images of flocks with various levels of plumage damage in a similar order to scientists, their  
31 perception of levels of IP in their own flocks varied, and was not consistently associated with the actual levels  
32 measured. Most farmers recognised both financial and welfare implications of IP and expressed pride in  
33 having a good-looking flock. The popular management strategies were those designed to redirect pecking to  
34 other objects, whereas a substantial barrier to uptake was the perception of creating other problems: for  
35 example mislaid eggs if early access to litter and range were adopted. To achieve uptake of knowledge that  
36 improves animal welfare on farm it may be necessary both to shift the norms perceived as acceptable, and to  
37 overcome barriers to change that include lack of time and understanding, by providing impartial advice and  
38 facilitation of ownership of the issues.

39

## 40 **Introduction**

41

42 The effects of injurious pecking (IP) by one bird on another are recognised as significant welfare and  
43 economic issues, in laying hen flocks. Not only can the recipient bird suffer considerable physical damage,  
44 which is painful and can lead to death from heat loss, disease or cannibalism, but IP can have a wider effect  
45 upon the entire flock, raising stress levels and the susceptibility for disease.<sup>1</sup> IP is associated with lower egg  
46 production levels at around 30 weeks (Huber-Eicher & Sebö 2001), partly explained by increased mortality, as  
47 victims of IP die sooner (Yngvesson *et al* 2004) thus producing fewer eggs over their lifetime with clear  
48 economic consequences. It is a widespread concern within the poultry sector as there is evidence of it  
49 occurring in all housing systems and across different bird ages (Bestman *et al* 2009). Between 50-90% of free  
50 range and organic flocks show evidence of IP (Bestman *et al* 2009; Lambton *et al* 2010), while in 100

---

<sup>1</sup> In this paper we use the term injurious pecking (IP) to include gentle and severe feather pecking, cannibalistic pecking and vent pecking (Lambton *et al* 2013). IP does not include aggressive behaviour, which is usually directed at the head, as it is thought to be a form of redirected foraging behaviour and may indicate that the environment is not meeting the behavioural needs of the hens (Weeks & Nicol 2006).

51 commercial UK free-range flocks monitored by Lambton *et al* (2013), the mean prevalence of severe pecking  
52 behaviour varied from 55% at 20 weeks, to 83% at 40 weeks of age.

53

54 In most commercial systems, the impact of IP is managed by routine beak trimming, although this does not  
55 necessarily reduce the performance of all IP behaviours (Pöttsch *et al* 2001; Lambton *et al* 2010) as it does  
56 not address the causal factors underlying IP. Beak trimming is a welfare concern (FAWC 2007) as it is a  
57 potentially painful mutilation that in principle should be avoided (Council directive 199/74/EC). In line with  
58 this, the UK government has scheduled the current derogation that permits beak trimming to terminate at the  
59 end of 2015 (House of Commons Library 2012). However, to ensure that hen welfare is not compromised, it  
60 needs to be possible to effectively manage IP by other means (FAWC 2009). The negative welfare  
61 consequences of uncontrolled IP would be greater than those caused by routine beak trimming. Consequently,  
62 there is a pressing need to identify other effective methods for controlling IP on commercial farms (Lambton  
63 *et al* 2013).

64

65 The shift from the routine physical intervention of beak trimming to practical flock management solutions  
66 raises two particular challenges. First, those responsible for flock health and welfare must be able to recognise  
67 and assess the relative levels and prevalence of IP in order to take appropriate action. Moreover, such  
68 assessments should be normalised, that is to say broadly comparable across different farms and systems if  
69 management solutions are to be coherently effective. Second, farmers faced with a range of possible  
70 management strategies need to be able to make confident and informed choices about which strategies to  
71 adopt.

72

73 There is a growing body of scientific literature identifying housing conditions, litter quality, and diet  
74 (reviewed by Nicol *et al* 2013; Rodenburg *et al* 2013) as primary risk factors for IP amongst flocks.  
75 Consequently it has become clear that management actions are, especially in the absence of beak trimming,  
76 increasingly important in reducing IP. Here, the factors that influence farmers in their understanding of the  
77 issue and in the selection of their management strategies (what we might term secondary risk factors, Why

78 2007) become equally critical. Drawing upon qualitative social science methodologies, this paper first  
79 explores farmer perception and recognition of different levels of plumage damage amongst laying-hen flocks  
80 and, second, examines how their own attitudes to and understanding of IP and its causes impact upon the  
81 choice of management strategies they adopt to address the issue.

82

83 In the study of which this paper is a part, Lambton *et al* (2013) developed a range of 46 management  
84 strategies which were used in 100 commercial free range (i.e. with daytime access to pasture) flocks most of  
85 which were beak-trimmed. They found that the more strategies deployed the greater the protective effect  
86 against severe feather pecking and plumage damage. Nonetheless, a mean of 84.1% birds per flock still  
87 displayed some degree of plumage damage at 40 weeks. Despite having one to one support and  
88 encouragement to adopt extra strategies relevant for each flock in 53 ‘treatment’ flocks, on average only about  
89 half of the 46 strategies were employed on any one farm. Thus it appears that further research is needed to  
90 identify the causal factors for IP and develop more effective means (including genetic) of reducing the risks in  
91 commercial flocks, as farmers remain generally reluctant to adopt additional management strategies to reduce  
92 IP.

93

94 Farmers’ attitudes towards health and welfare problems and related intervention programmes, such as those to  
95 reduce IP, have become an important area of recent research (Boivin *et al* 2003; Kauppinen *et al* 2010;  
96 Kielland *et al* 2010). A greater understanding of farmer attitudes is widely held as a necessary prerequisite for  
97 the subsequent understanding of farmer behaviour, itself a critical prerequisite for promoting behavioural  
98 change to achieve improved levels of farm animal welfare (Whay 2007). Specific methodologies have been  
99 developed to understand and predict farmer attitudes and behaviour in general, originally with respect to  
100 innovation adoption, but more recently with respect to engagement in pro-environmental and pro-welfare  
101 behaviour and practices (Escobar & Buller, 2014). Although much of this has been wrapped up into forms of  
102 predictive behavioural modelling (for example, Ajzen 1991; Ajzen 1998; Ellis-Iversen *et al* 2010),  
103 understanding the social and individual drivers for attitudinal and behavioural change has become an  
104 important component in our understanding of how evidence-based knowledge and experimental experience

105 can be enrolled into practical and durable changes in livestock management. Contemporary behavioural  
106 research acknowledges that rational economic calculation sits alongside a multitude of other considerations in  
107 the determination of behaviours and practices. Drawing in part on the language of the Theory of Planned  
108 Behaviour (Ajzen 1991), these might include intrinsic factors, such as perception of social norms, peer  
109 pressure, attitudes towards the sources, forms and flows of information, assessments of personal capacity and  
110 agency, past experience, values and others (Vaarst *et al* 2002) as well as the more extrinsic factors relating to  
111 access to informational, economic and social resources. Collectively, these increasingly numerous and  
112 complex elements become recognised as actual or potential determinants of individual behaviour and  
113 therefore key sites for addressing the possibility of behavioural change and to achieve desired policy  
114 outcomes.

115

116 Researchers in the social sciences have more recently suggested that the routine performance of social  
117 practices (which include system design, material arrangements, social relations, sector rules and  
118 knowledge flows) plays a much larger role in determining actions than the focus on individual attitudes,  
119 values and beliefs might imply (Hargreaves 2011). Hence a growing emphasis is being placed on how such  
120 practices develop, are normalised and are reinforced through unchallenged repetition. Change, if it is to be  
121 sought and achieved, derives from a re-positioning and development of those practices rather than solely from  
122 individual behaviour. With this in mind, the current study begins by considering how certain levels of IP  
123 become normalised while others might be considered unacceptable. Drawing upon farmer interviews, the  
124 study investigates how management practices for addressing the issue of IP are developed and enacted,  
125 looking at the relative influence of intrinsic and extrinsic individual behavioural factors. The paper addresses  
126 the need for more information on barriers to uptake of knowledge on farm by interviewing a proportion of the  
127 farmers involved in the study described by Lambton *et al* (2013).

128

## 129 **Materials and Methods**

130

131 The study reported here was conceived as an adjunct to the research by Lambton *et al* (2013), the aim of  
132 which was first to identify practical evidence-based ‘management strategies’ to control IP and second to

133 monitor the cumulative effectiveness of these strategies when implemented in 100 commercial flocks of  
134 laying hens kept in free-range housing systems. As part of this process, 53 so-called ‘treatment’ flocks were  
135 provided with bespoke advice and encouraged to adopt more management strategies. Levels of uptake were  
136 then monitored alongside the impact on their flock performance and welfare (levels of plumage damage, IP  
137 behaviour, production, mortality etc.). By way of comparison 47 ‘control’ flocks, for which no advice was  
138 given, were merely monitored. All these flocks were kept on 63 farms throughout Great Britain and all were  
139 already using a varied number of the management strategies at the start of the study. At the end of the primary  
140 study all the farmers received a management booklet including suggested management strategies and research  
141 findings and this, together with other sources of evidence-based knowledge now provide farmers with tested  
142 information (available from [www.featherwel.org](http://www.featherwel.org)). As all had restocked with another flock by the time of  
143 interview, they could have read and adopted some of this information, particularly if they had managed a  
144 ‘control’ flock for the main study.

## 145 **Participants and interviews**

146

147 In order to select 12 potential participants for interview all the farmers who had participated in the main study  
148 (Lambton *et al* 2013) were ordered separately, according to the number of management strategies they had  
149 employed (regardless of whether or not the strategies were suggested by the project team), into three  
150 categories ‘high’, ‘medium’ and ‘low’ adopters. ‘Treatment’ and ‘control’ groups were ordered separately. As  
151 treatment flocks generally adopted more management strategies (likely due to suggestions made by the project  
152 team), the proportion of the 46 potential strategies used by ‘high’ adopters was in the range 59-78%;  
153 ‘medium’ and ‘low’ adopters used 46-58% and 18-45% respectively. For control flocks 39-54% was  
154 considered high adoption, 36-39% medium, and 24-35% low adoption.

155

156 From all 63 farms, three farmers directly responsible for flock management were randomly selected for face-  
157 to-face interview from each of the ‘high’, ‘medium’ and ‘low’ levels of management strategy adoption for  
158 treatment flocks and one farmer for each level from control flocks (summary data are shown in Table 1). Of  
159 the 12 farmers selected for interview, three had run organic flocks of which one had intact beak birds: the  
160 second intact beak flock was not organic. The farmers also varied in age, experience and gender. Mean flock

161 size was 7,145 (range 2,808-15,400) with a range of five breeds in those sampled. One of four researchers  
162 visited each farm and interviewed the farm owner or stockperson (hereafter referred to as ‘the farmer’). The  
163 recorded, semi-structured interview was based on a set of open-ended questions that explored the farmer’s  
164 perception of IP, management strategies, advice and advisors, and issues regarding implementation. These  
165 researchers were all involved in drawing up the questionnaire and had discussed together how to carry out the  
166 interview with the guidance of experienced Sociologist HB.

167

168 The sample of 12 farmers was intentionally small. The aim was to undertake an in-depth study of farmer  
169 perception, motivation and action through individual interviewed cases. In line with an earlier study  
170 (Horseman et al 2014) no claim is made here that the findings can be generalized to wider population of  
171 poultry farmers. A recognised point of data saturation (Morse 1995) was reached in the current study with the  
172 emergence of a number of key themes. This is consistent with other studies that have found that the key  
173 elements for meta-themes (Bazeley 2009) may emerge from relatively small, yet sufficient numbers of in-  
174 depth interviews.

175

176 **Table 1 about here**

177

### 178 **Ranking of photos of plumage damage**

179

180 Drawing on visual research methodologies developed, particularly, in environmental and conservation  
181 planning (for example, Manning & Freimund 2004), and adapting them to the current research objective of  
182 determining the normalisation of certain levels of IP, a set of nine photographs of flocks of birds, each with  
183 different degrees of feather cover, was presented to each farmer in a random order. The farmer was told that  
184 flocks were all in the same age range (30-40 weeks) and was asked to order the photographs from best to  
185 worst plumage condition; equal ranks were not allowed within the photoset, so no two photographs received  
186 the same rank from one farmer. The farmer was also asked to identify the point at which they would consider  
187 the level of plumage damage (indicative of IP) to be unacceptable. The research group agreed upon a ‘gold

188 standard' for the rank order of the photographs and this gave the photographs an additional label from A (best)  
189 to I (worst feather cover) to compare with the farmer rankings. The research group were all experienced in  
190 feather scoring on farm using standardised scoring systems such as those used in Lambton et al (2013) or in  
191 the Laywel project (Blokhuis et al, 2007), thus there was a systematic basis for the 'gold standard' ranking.  
192 Statistical analysis was carried out on the photo rankings using IBM SPSS Statistics 19 (IBM Corp., Armonk,  
193 NY). Inter-rater agreement was calculated by computing kappa for all rater-pairs and using the mean of the  
194 estimates to provide an overall index of agreement (Hallgren 2012) between farmers. The mean kappa value  
195 was also calculated to compare each farmer ranking with the 'gold standard' commonly agreed upon by the  
196 research group. The level of agreement indicated by the kappa values was interpreted as 'poor' (0.00-0.4),  
197 'moderate' (0.41-0.60), 'substantial' (0.61-0.80) or 'excellent' (>0.81); these values were based on the  
198 benchmarks provided by Landis & Koch (1977) and Fleiss *et al* (2003). The point at which the farmers  
199 viewed the plumage damage as unacceptable was qualitatively examined to identify reasons for their decision.  
200 This 'tipping point' was analysed in terms of rank position and the first photo with unacceptable plumage  
201 damage.

## 202 **Interviews**

203 Audio recordings of the interviews were manually transcribed. Subsequent themes emerging from the  
204 interview transcripts were identified using scrutiny techniques; searching for repetitions within and between  
205 interviews and highlighting similarities and differences between texts, as suggested by Ryan & Bernard  
206 (2003). A processing technique of 'cutting and sorting' (Ryan & Bernard 2003) was used to group similar  
207 themes together and identify the most relevant for analysis. Specifically, each transcript was read and relevant  
208 dialogue was highlighted. The highlighted sections were collectively grouped into meta-themes relating to: the  
209 perception of IP; attitudes towards management strategies; barriers to management strategy uptake; and  
210 knowledge transfer.

211



212 **Results**

213 **Normalisation of plumage damage**

214 The results of the photographic survey were available for 8 of the 12 farmers interviewed and reveal what we  
215 choose to call a 'moderate' level of agreement between farmers (mean kappa 0.500; total rater-pairs, 28; range  
216 0.125-1.000) and 'substantial' agreement between farmers and the agreed gold standard (mean kappa 0.719;  
217 total rater-pairs, 8; range 0.500-1.000) as shown in Table 2 and indicated by the kappa values. For technical  
218 reasons the full data were not available for farmers E, F, H and J. Reassuringly, farmers were clearly able to  
219 identify the progressively worse levels of plumage damage.

220

221 **Table 2 about here**

222

223 Nonetheless, the level at which they would become concerned varied. Data were available for 10 of the 12  
224 farmers interviewed (missing data from K and J). As shown in Table 3, most farmers considered only 3-4  
225 flocks had unacceptable levels of plumage damage, whereas three felt most photographs were unacceptable,  
226 drawing the line below 3-4 flocks with good feather cover. The farmers who were more tolerant of plumage  
227 damage had flocks of various sizes, with evidence of IP and plumage damage whereas the farmers 'drawing  
228 the line' earlier had relatively small flocks (<5000) and two were organic.

229

230 **Table 3 about here.**

231

232 Smaller producers are, we would suggest, more sensitive to the occurrence of IP, perhaps because plumage  
233 damage is more obvious sooner in a smaller flock, or because the farmers are more aware of individual bird  
234 behaviour within smaller flocks. Farmer I, though interviewed based on their organic study flock, also had  
235 conventional free range flocks and mentioned concern at different levels of plumage damage depending on the  
236 housing system implying that different systems evoke different levels of concern. Organic assurance schemes  
237 tend to specify that hens be kept without beak-trimming so it is likely that farmers with intact beak flocks are  
238 more aware of IP, since the potential consequences of an outbreak are greater in intact beak flocks.

239

240 In this exercise, farmers only moderately agreed on the photograph rankings and identified varying levels of  
241 plumage damage in the photographs as representing the point at which they would become concerned.

242

### 243 **Perception of Injurious pecking from interview analysis**

244 Qualitative analysis of the interviews showed that farmers expected flocks to show some level of plumage  
245 damage by the end of lay; Farmer C maintained that: “just by the nature of all that output, [the hens are] not  
246 going to look [perfect] at 72 weeks”. One quarter of all interviewed farmers said they would be unconcerned if  
247 a small proportion of the flock experienced feather loss, but would consider the same level of plumage  
248 damage to be unacceptable if the majority of birds were affected. Moreover, feather loss was sometimes  
249 associated with specific breeds: “we did have birds nearly as bad as that... but I reckon it was because they  
250 were [Breed X] and they were renowned for losing their feathers” (Farmer G).

251

252 Three of the participating farmers (K, G, and B) did not perceive IP to be a problem amongst their flocks.  
253 Farmer K's perception was substantiated, since they implemented the third highest number of management  
254 strategies by the end of the Lambton et al (2013) study and had the lowest measured IP and plumage damage  
255 levels. Farmer G, who found only the worst 3 flocks in the photoset to show unacceptable levels of plumage  
256 damage, said "I don't find [IP to be] an important issue, I don't have a problem with pecking" (though  
257 researchers found evidence of IP occurring in their flocks). This suggests Farmer G's normative frame of  
258 reference allows the presence of IP to be tolerated and accepted. Although Farmer B did not perceive a  
259 problem with IP in their current flock, they were aware of the problem in their previous flock (which provided  
260 data for Table 1) and had since implemented further measures. As many as half the farmers interviewed  
261 considered IP to be only a ‘moderate’ problem despite reporting that they had certainly had recent problems  
262 with IP in these beak trimmed flocks of up to 15 thousand birds. That IP is harder to manage in birds with  
263 intact beaks was confirmed by two organic farmers (E, who at the time of interview housed organic flocks  
264 with intact beaks, and L) who thought IP was an important issue and were currently experiencing IP issues in

265 their flocks "[IP is] definitely one of the most important issues... it's very noticeable... I seem to have struggled  
266 with the last few flocks that I've had" (Farmer L).

267

268 Seven farmers linked IP to both welfare and financial implications. Farmer L told us: "if I have poor welfare,  
269 then I have a poor financial return, so the two are interlinked... the driver is I don't like seeing birds which are  
270 being picked on... but we're all in here to make money". Between the two areas of concern, four of these  
271 deemed welfare to be most important, though a further two identified IP as primarily a financial issue.

272

273 The majority (9/12) believed IP to be indicative of problems relating to farm management, environment and  
274 the health of the birds. Farmer F argued: "I think that feather cover usually is an indication of the overall  
275 health of the bird as much as other measures you are putting in... If they are feeling stressed, because of  
276 health issues or management, then that is expressed in feather pecking".

277

278 Two thirds of farmers relied on their own judgement to identify an IP problem on their farm and perceived  
279 having a well feathered flock as important for reasons of job satisfaction and professional identity, for  
280 example, Farmer C maintained: "you've got to work with them every day, so you don't really want a bunch of  
281 straggly, horrible looking chickens". This might include pride in having a good-looking flock and the need to  
282 give visitors a good impression: "It's just the overall perception of good animal health and husbandry really,  
283 for those who come to see the chickens, whether it be customers or other, auditors or whoever" (Farmer F).

284 Ten of our respondent farmers believed the public was essentially ignorant of the issue, and the problem, of  
285 IP.

286

287 Virtually all of the farmers interviewed accepted some responsibility for IP occurring in their flocks. Farmer B  
288 stated: "the old flock... came from exactly the same rearer, they were reared in exactly the same way, they've  
289 both been on the same feed, same breed... points to management... I'll have to confess, really." When asked  
290 who else should be doing something about IP, two thirds said that breeding companies should be working  
291 towards producing birds for free range and organic systems rather than focusing on caged birds. Three farmers

292 wanted more research to be done, especially before the proposed UK ban on beak trimming is enforced and  
293 comments like “you can’t introduce a ban on this beak tipping... until you have a suitable answer for [IP]”  
294 (Farmer C) were frequently made. Two thirds of farmers said it was important to prevent IP from starting at  
295 rear, before the pullets reach the laying farm. Three were simply more fatalistic: “I don’t think there is  
296 anything anyone can do, it is just down to the flock” (Farmer D), which also suggests a perceived lack of  
297 control over the occurrence of IP at a personal level.

298

### 299 **Attitudes towards Management Strategies**

300 All of the participant farmers, with a single exception, were keen to take on additional measures to address IP  
301 and especially so if IP was perceived as an on-going problem on the farm. A typical example was given by  
302 Farmer A: “I would say [I am] broadly keen [to employ measures], because they are generally simple things  
303 that one can do to put it right so I’d be very happy to”. The only participant not to engage with additional  
304 measures was already implementing many strategies and was not keen to do more than he was already doing  
305 (Farmer J).

306

307 All respondents considered the general management of flocks to be important in controlling IP, such as  
308 controlling ventilation, temperature and light intensity in the building; adopting disease control measures and  
309 water sanitation; managing litter condition and hens’ diet. Farmer C noted that: “There’s other fundamentals  
310 that you’ve got to get right before hanging a toy [will improve IP] ... If you’ve got an issue with lighting, or  
311 ventilation, then a bit of string or toys aren’t going to make any difference really.” One third of farmers also  
312 believed that spending time around the birds was important in order to notice changes or deal with any  
313 problems.

314

315 The most popular management strategies were those with numerous benefits and a clear strategic purpose; for  
316 example to give birds activities to reduce boredom. Nine of the farmers approved of management strategies  
317 aimed at promoting foraging behaviour using what one of them described as ‘distraction techniques’ such as  
318 scattering whole wheat and grit on the litter, or providing objects for birds to peck at such as straw bales,  
319 hanging objects and hard blocks to peck at. Farmer D stated: “I think the best [management strategies] were

320 getting them out early and some good litter, because if they are busy on the litter then they are not feather  
321 pecking, they are busy doing something else”. Three quarters of our respondents were also keen to implement  
322 measures designed to increase range use (thereby also decreasing stocking density within the shed), usually  
323 mentioning providing more shelter. For example, Farmer A said they would put in place “anything to make  
324 the range more interesting, so I think more shelters comes into that category”.

325

326 However, interviewees also identified a number of unpopular management strategies which they had found to  
327 be ineffective or to cause other problems. For example, allowing access to range within two weeks of  
328 placement on the laying farm was implemented by only three farmers as it was commonly believed to cause  
329 an increase in eggs laid outside nest boxes. Farmer K claimed: “You really want [the hens] to get used to the  
330 nest boxes and if you let them out [on the range] too early they tend to want to lay their eggs outside... Once  
331 they start laying outside you’ll *never* get them to change... We’ve tried it before and it was a disaster: we got  
332 quite a lot of eggs outside, we were collecting more outside just about as what we were collecting inside”.

333 Though all but one farmer said that floor eggs were not a big problem, the fear of creating a problem  
334 prevented them from allowing early access to the range, and in some cases to the litter; farmers generally  
335 wanted to train the birds to use the nest boxes, so would wait until a high proportion of the flock were laying  
336 before allowing them outside. A practical solution to this adoption barrier is the option of allowing the hens to  
337 have access to litter or range in the afternoons only, which is a successful strategy that many farmers now  
338 adopt. A farmer (RM) not interviewed in this study, reported that “I would never lock the birds up on the slats  
339 again at placement. I’ve got a better, calmer flock by giving access straight away” (Featherwel 2013).

340

### 341 **Barriers to the Uptake of Management Strategies**

342 Farmers consistently showed a strong reluctance to adopt management strategies they felt were beyond their  
343 capacity to control. Most notable and most frequent reasons included the lack of consistent identifiable causes  
344 of IP and there being no guarantee that the adoption of particular management strategies would be reliably  
345 effective in controlling IP. “There is no such thing as a blueprint that you’ve got to follow and you say... you

346 do that every time, you won't get a pecking issue" argued one respondent (Farmer L) with three quarters of  
347 the other interviewees making others making similar statements.

348

349 Lack of control over the weather was also an important barrier for certain management strategies (access to  
350 range, litter management) and was mentioned by three quarters of farmers. For example Farmer H reported:  
351 "This year because we've had the wettest time ever... we've had trouble with [litter] capping and sticking and  
352 I've been throwing sawdust at it... to get [good litter quality] at this time of year, you'll spend all your time  
353 throwing litter at it."

354

355 As implied earlier, the genetics of the birds was also specifically mentioned by seven farmers as a major factor  
356 influencing IP that lies outside their control. One farmer with an organic flock believed that: "the majority of  
357 their breeders are for caged birds, aren't they? They breed them for the cage environment, not free range, not  
358 organic" (Farmer I), a view endorsed by scientists (for example Nicol et al, 2013, the LayWel project  
359 ([www.laywel.eu](http://www.laywel.eu)) who argue for greater emphasis to be placed on selecting genotypes with reduced damaging  
360 feather pecking tendencies for use in alternative laying hen housing systems. The rearing environment was  
361 also considered by half of respondent farmers in this study to be out of their control. While producers can  
362 often select the strain of bird and the rearer, they may still be constrained by limited genotypes, proximity to  
363 rearers, historical use and company policy thus in some instances these difficulties faced by producers are  
364 indeed hard to overcome.

365

366 Part of the problem is that managing IP on farms requires time in what are perceived as already intense  
367 schedules of work. Adopting additional strategies only increases that pressure on time and non-essential tasks  
368 become postponed. IP management strategies may be difficult to fit into the established routine, thus be  
369 overlooked: "I think we made a conscious effort to get them out earlier than usual [i.e. than previously  
370 practised] and we just haven't done it on this occasion. Not by any particular management decision, it's just  
371 slipped... fallen back into the old routine" (Farmer F).

372

373 Although all of the farmers stated that financial implications needed to be considered before implementing  
374 management strategies (one claiming: “I will look at anything to improve the birds’ welfare, but it has to be  
375 financially viable to do it”, Farmer G), seven actively downplayed the financial implications of instigating  
376 management strategies suggesting they were “pretty cheap” and maintaining they would regain the initial cost  
377 by increasing production and reducing problems. This dismissal of economic concern suggests that intrinsic,  
378 rather than extrinsic, factors play a key role in determining uptake of management strategies.

379

### 380 **Knowledge Transfer**

381 Interviewed farmers thought that good, independent advice about IP was difficult to obtain: one claiming “I  
382 wouldn’t say it’s easy - clear, concise advice is more difficult to come by” (Farmer L) and another that  
383 “there’s not many independents out there. Whoever’s going to tell you something has got a motive for telling  
384 you... or something to sell” (Farmer G). Poultry trade magazines were not a popular information source, with  
385 only a few farmers mentioning that some magazines were more helpful than others in terms of including  
386 relevant articles though subscription fees had become expensive. The internet, as a source of useful  
387 information, was only used by 3 farmers with just 4 others recognising others might find it valuable but not  
388 themselves: “you can go on the internet if you are that way inclined, but I’m not too good on the internet, I  
389 never seem to get what I want off” (Farmer I).

390

391 As one might expect, the interviewed farmers sought advice from people they considered knowledgeable  
392 about poultry farming, such as veterinarians and feed company representatives. Two thirds of farmers valued  
393 the opinions of other egg producers; with six suggesting that organised producer meetings and/or training  
394 courses would be beneficial. Nine specifically valued the input and expertise of the University of Bristol  
395 research group, Farmer A typifying their views: “the vet has been in the game a very long time and he would  
396 probably have some comments to make on [IP], but as I said before, now we know who you are and what  
397 you’re doing, it’s obvious that we’d come to you [the research group]”. Though these comments may have  
398 been exaggerated since farmers were reporting to the Bristol team, a key finding of the study was that the  
399 majority of farmers valued evidence-based knowledge and advice. Over half of the participant farmers said

400 that taking part in the main study had increased their awareness of IP: “I think [the project] has made me more  
401 aware of [IP, sooner] than I might have been in the past, because I know now what to look for... like pecking  
402 around the vent area or pulling tail feathers” (Farmer E) while five said they would interpret advice based on  
403 their own experience to judge what was most applicable on their farm.

404

## 405 **Discussion and Conclusions**

406

407 With the growing human population it is becoming a priority that farmers adopt the latest techniques to  
408 improve sustainability, productivity and animal health and welfare. Indeed this is a priority area for EU  
409 funding ([http://ec.europa.eu/agriculture/research-innovation/index\\_en.htm](http://ec.europa.eu/agriculture/research-innovation/index_en.htm)). To be effective, knowledge  
410 transfer programmes should, first, aim to both shift perceived norms and attitudes so that issues become  
411 recognised, and, second, lead to actions that move towards their resolution. In an earlier study (Lambton et al,  
412 2013) intervention was reported by farmers to increase their awareness of IP and their ability to identify it in  
413 their flocks, thus theoretically meeting the first premise. In this current study, the exercise in which farmers  
414 ranked photographs of flocks with various levels of feather loss nonetheless indicated that there remained a  
415 range of perceptions as to what constitutes an acceptable level of IP. Since farmers determine whether they  
416 have a problem with IP based on their own normative frame of reference (Jansen et al 2009), consistently high  
417 levels of IP can result in such levels being considered normal, and therefore acceptable. This appeared to be  
418 the case in half the farmers interviewed in this study, who considered IP to be only a ‘moderate’ problem.  
419 Moreover, as farmers rely largely on their own judgement to identify IP in their own flocks and when to  
420 intervene, facilitating an understanding of the many reasons why IP is a problem and embedding awareness of  
421 the early signs of IP in their flocks may enable them to identify and take early action against an IP problem.  
422 Providing standardised criteria (e.g. photographs of example flocks) to assist identification of an IP problem,  
423 rather than simply relying on their past experiences, may encourage action against IP to be taken sooner.  
424 Moreover, they may extend and re-qualify an individual’s normative frame of reference. There is evidence  
425 from the AssureWel project ([www.assurewel.org](http://www.assurewel.org)) that a combination of information regarding the control of  
426 IP and the encouragement of farmers to plumage score their own birds has led to significantly decreased levels



427 of mortality and plumage damage (Mullan et al, *in press*). Lambton et al, 2013 also stimulated adoption of  
428 strategies which overall achieved the desired outcomes but in this study we have additionally revealed some  
429 of the factors underlying the range of uptake between farms.

430 Whether or not individual farmers sought to adopt additional strategies to manage IP was strongly influenced  
431 by their perception of the benefits of such strategies and the risks they might pose in terms of time and  
432 finance. This is entirely consistent with Coleman et al's 1998 observation that intrinsic factors, in the form of  
433 individual attitudes towards relevant behaviours are important in determining whether or not they are  
434 adopted. The principal barriers to uptake were a lack of time and lack of control over external factors  
435 according to the farmers interviewed. Similarly, dairy farmers identified lack of time and labour availability as  
436 principal constraints in treating mastitis (Horseman et al, 2014). Thus, finding management strategies which  
437 are easily incorporated into the existing routines, potentially associating a 'non-essential' measure with  
438 'essential' maintenance could reduce the perception of adding another task to a full work schedule. There is  
439 also scope for innovation to ease the workload of producers such as developing less labour intensive methods  
440 of litter management to prevent litter capping during wet weather or of adding objects for hens to peck at.

441 A further indicator that intrinsic factors were important was the fact that farmers in general did not see a  
442 financial barrier to adopting additional measures, regarding many of them as being relatively cheap and cost-  
443 effective. Personal values such as professional pride and job satisfaction were greater incentives for change  
444 than public opinion. However a frequently cited reason for not adopting measures to reduce the risk of IP was  
445 the lack of a 'blueprint' of measures proven to be consistently effective, which may be viewed as a  
446 combination of intrinsic (perceived helplessness) and extrinsic influences.

447 Extrinsic factors highlighted as providing barriers to change were those like the genetics of the birds or the  
448 weather over which farmers had none or very limited control. Farmers were especially resistant to adopting  
449 strategies such as early access to litter or range which they perceived to have associated downsides such as  
450 mislaid eggs. Here the key to driving change is altering perception and providing evidence that the actual  
451 outcome may be different to that perceived. Lambton et al, 2013 and Featherwel provide farmers with  
452 evidence that others have acceptable outcomes from not restricting access, and also that a compromise state  
453 whereby birds have access in the afternoons, after the main egg-laying period may be achieved, thus shifting  
454 perceptions from an 'all or nothing' viewpoint. Shifting attitude to a proactive mindset that finds solutions by

455 asking ‘how can we achieve the desired outcome?’ and ‘can we do this another way?’ appears to be very  
456 important in facilitating change and uptake of interventions and knowledge on farm.

457

### 458 **Animal welfare implications**

459 Farmers’ attitudes towards health and welfare problems and related intervention programmes, such as those to  
460 reduce injurious pecking (IP) in hens, directly influence the welfare of animals in their care. This study has  
461 shown that their perception of an IP problem may rely on their normative frame of reference and has  
462 identified intrinsic factors as the principal barriers to change. Thus schemes aimed at improving animal  
463 welfare on farm should not only provide independent, evidence-based knowledge but also consider  
464 techniques, such as providing photographs, to inform and shift perceived ‘norms’ and to promote farmer-led  
465 innovative solutions.

466

### 467 **Acknowledgements**

468 This project was supported by the Tubney Charitable Trust. We are most grateful for the help of the farmers  
469 who were interviewed and to all the producers who allowed access to their farms and data. We thank Jon  
470 Walton and Emma Gale for assistance with interviews and audio transcription.

471

### 472 **References**

- 473 **Ajzen I** 1991 The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes* 50:  
474 179-211
- 475 **Ajzen I** 1998 Models of human social behaviour and their application to health psychology. *Psychology and*  
476 *Health* 13: 735-739
- 477 **Bazeley P** 2009 Analysing Qualitative Data: More than ‘Identifying Themes’. *The Malaysian Journal of*  
478 *Qualitative Research* 2: 6-22
- 479 **Bestman M, Koene P and Wagenaar JP** 2009 Influence of farm factors on the occurrence of feather pecking  
480 in organic reared hens and their predictability for feather pecking in the laying period. *Applied Animal*  
481 *Behaviour Science* 121: 120-125

- 482 **Blokhuis HJ, Fiks van Niekerk T, Bessei W, Elson A, Guemene JB, Kjaer JB, Maria Levrino GA, Nicol**  
483 **CJ, Tauson R, Weeks CA and Van De Weerd H** 2007 The LayWel project: welfare implications of  
484 changes in production systems for laying hens. *World's Poultry Science Journal* 63:101-114
- 485 **Boivin X, Lensink J, Tailet C and Vessier I** 2003 Stockmanship and farm animal welfare. *Animal Welfare*  
486 12: 479-492
- 487 **Coleman GJ, Hemsworth PH and Hay M** 1998 Predicting stockperson behaviour towards pigs from  
488 attitudinal and job-related variables and empathy. *Applied Animal Behaviour Science* 58: 63-75
- 489 **Ellis-Iversen J, Cook AJC, Watson E, Nielen M, Larkin L, Wooldridge M and Hogeveen H** 2010  
490 Perceptions, circumstances and motivators that influence implementation of zoonotic control programs on  
491 cattle farms. *Preventive Veterinary Medicine* 93: 276-285
- 492 **Escobar MP and Buller H** 2014 Projecting Social Science into Defra's Animal Welfare Evidence Base: A  
493 Review of current research and evidence base on the issue of farmer behaviour: A report to the Department  
494 for Environment, Food and Rural Affairs
- 495 **FAWC** 2007 Opinion on Beak Trimming of Laying Hens. Government Report.  
496 <http://www.fawc.org.uk/pdf/beak-trimming.pdf>.
- 497 **FAWC** 2009 Beak trimming of laying hens. Letter to Ministers.  
498 <http://www.fawc.org.uk/pdf/beaktrimming.pdf>.
- 499 **Featherwel** 2013 Improving Feather Cover: A guide to reducing the risk of injurious pecking occurring in  
500 non-cage laying hens. Downloadable from the website which also provides information:  
501 [www.featherwel.org](http://www.featherwel.org)
- 502 **Fleiss JL, Levin B and Paik MC** 2003 *Statistical Methods for Rates and Proportions, 3<sup>rd</sup> Edition*. Wiley &  
503 Sons: New York, USA
- 504 **Hallgren KA** 2012 Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial.  
505 *Tutorials in Quantitative Methods for Psychology* 8: 23-34
- 506 **Hargreaves, T** 2011 Practice-ing behaviour change: Applying social practice theory to pro-environmental  
507 behaviour change. *Journal of Consumer Culture* 11: 79-99

508 **Horseman SV, Roe EJ, Huxley JN, Bell NJ, Mason CS and Whay HR** 2014 The use of in-depth interviews  
509 to understand the process of treating lame dairy cows from the farmers' perspective. *Animal Welfare* 23:  
510 157-165

511 **House of Commons Library** 2012 Battery Hens. Standard Note: SN/SC/1367.  
512 <http://www.parliament.uk/briefing-papers/SN01367/battery-hens>.

513 **Huber-Eicher B and Sebö F** 2001 The prevalence of feather pecking and development in commercial flocks  
514 of laying hens. *Applied Animal Behaviour Science* 74: 223-231

515 **Jansen J, van den Borne BHP, Renes RJ, van Schaik G, Lam TJGM and Leeuwis C** 2009 Explaining  
516 mastitis incidence in Dutch dairy farming: The influence of farmers' attitudes and behaviour. *Preventive*  
517 *Veterinary Medicine* 92: 210-223

518 **Kauppinen T, Vainio A, Valros A, Rita H and Vesala KM** 2010 Improving animal welfare: qualitative and  
519 quantitative methodology in the study of farmers' attitudes. *Animal Welfare* 19: 523-536

520 **Kielland C, Skjerve E, Osteras O and Zanella A** 2010 Dairy farmer attitudes and empathy toward animals  
521 are associated with animal welfare indicators. *Journal of Dairy Science* 93: 2998-3006

522 **Lambton SL, Knowles TG, Yorke C and Nicol CJ** 2010 The risk factors affecting the development of  
523 gentle and severe feather pecking in loose housed laying hens. *Applied Animal Behaviour Science* 123: 32-  
524 42

525 **Lambton SL, Nicol CJ, Friel M, Main DCJ, McKinstry JL, Sherwin CM, Walton J and Weeks CA** 2013  
526 A bespoke management package can reduce levels of injurious pecking in loose-housed laying hen flocks.  
527 *Veterinary Record* 172: 423+

528 **Landis JR and Koch GG** 1977 The Measurement of Observer Agreement for Categorical Data. *Biometrics*  
529 33: 159-174

530 **Manning RE and Freimund WA** 2004 Use of visual research methods to measure standards of quality for  
531 parks and outdoor recreation. *Journal of Leisure Research* 36: 557-579

532 **Morse JM** 1995 The significance of saturation. *Qualitative Health Research* 5: 147-149

533 **Mullan S, Szymaragd C, Cooper, MD, Wrathall, JHM, Jamieson J, Bond A, Atkinson C and Main, DCJ**  
534 (2015) Animal welfare initiatives improve feather cover of cage-free laying hens in the UK. *Animal*  
535 *Welfare (In press)*

536 **Nicol CJ, Bestman M, Gilani A-M, de Haas EN, de Jong IC, Lambton S, Wagenaar JP, Weeks CA and**  
537 **Rodenburg TB** 2013 The prevention and control of feather pecking: application to commercial systems.  
538 *World's Poultry Science Journal* 69: 775-787

539 **Pötzh CJ, Lewis K, Nicol CJ and Green LE** 2001 A cross-sectional study of the prevalence of vent  
540 pecking in laying hens in alternative systems and its associations with feather pecking, management and  
541 disease. *Applied Animal Behaviour Science* 71: 259-272

542 **Ryan GW & Bernard HR** 2003 Techniques to Identify Themes. *Field Methods* 15: 85-109

543 **Rodenburg TB, van Krimpen MM, de Jong IC, de Haas EN, Kops MS, Riedstra BJ, Nordquist RE,**  
544 **Wagenaar JP, Bestman M and Nicol CJ** 2013 The prevention and control of feather pecking in laying  
545 hens: identifying the underlying principles. *World's Poultry Science Journal* 69(2): 361-374

546 **Vaarst M, Paarup-Laursen B, Houe H, Fossing C and Andersen HJ** 2002 Farmers' choice of medical  
547 treatment of mastitis in Danish dairy herds based on qualitative research interviews. *Journal of Dairy*  
548 *Science* 85: 992-1001

549 **Weeks CA and Nicol CJ** 2006 Behavioural needs, priorities and preferences of laying hens. *World's Poultry*  
550 *Science Journal* 62: 296-307

551 **Whay HR** 2007 The journey to animal welfare improvement. *Animal Welfare* 16: 117-122

552 **Yngvesson J, Keeling LJ and Newberry RC** 2004 Individual production differences do not explain  
553 cannibalistic behaviour in laying hens. *British Poultry Science* 45: 453-462