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Working towards a reduction in cattle lameness: 1. Understanding barriers to lameness control on dairy farms

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ABSTRACT

On 222 dairy farms, the farmer's perception of the scale of the herd lameness problem was compared with the prevalence detected by observation of the milking herd, and a questionnaire explored the barriers to lameness reduction. Ninety percent of farmers did not perceive lameness to be a major problem on their farm, although the average prevalence of lameness was 36%. For 62% of the sample, lameness was not the top priority for efforts made to improve herd health. Time and labour were important limiting factors for lameness control activities and financial constraints prevented farmers taking action on advice in 30% of cases. Farmers' understanding the implications of lameness for the farm business was limited. Lameness reduction is restricted by farmers' perception of lameness, but also by time, labour and finance; these issues need to be addressed at the industry level to support animal welfare improvement.

1. Introduction

The body of scientific and technical information on lameness in dairy cattle has grown recently, with the activities of projects such as "Lamecow", funded under the EU Sixth Framework (Amory et al., 2006; Barker et al., 2009) and applied behavioural studies in North America (Cook et al., 2004). However, lameness in dairy herds remains a problem. The most recent reports from the UK suggest that the prevalence is in fact increasing, with figures of 36% reported for 2006–2007 (Barker et al., 2010), compared with 21% for 1989–1990 (Clarkson et al., 1996). The challenge of introducing animal welfare interventions is large, when farmers are asked to change their actions on behalf of their animals (Whay, 2007). Improving animal welfare by reducing lameness requires that farmers adapt existing practices or resources. Research into human behaviour shows that there is always an underlying resistance to change in itself (Rosenstock, 1974). To promote change, it is necessary to understand both the barriers that currently restrict farmers' efforts to control lameness, and the positive motivators for change (Whay, 2007; Garforth et al., 2006). Once these are understood, progress could be made using techniques such as social marketing (McKenzie-Mohr and Smith, 1999; Sorensen et al., 2008). This paper addresses the question of why dairy farmers are not making progress in lameness control, (i.e. the barriers), and positive motivators are considered in a sequential paper (Leach et al., 2010). These issues, in the context of lameness control, have received little attention in recent literature, with the exception of a short report by Mill and Ward in 1994, although there have been publications covering some similar concepts with reference to mastitis control (Valeeva et al., 2007), herd health planning (Bell et al., 2006; Kristensen and Enevoldsen, 2008), and adoption of oestrus detection methods to improve fertility (Garforth et al., 2006).

One likely factor contributing to the sustained problem of lameness in dairy herds is that farmers underestimate the prevalence of lameness on their farms, and therefore do not perceive the need to take further action to control it. Whay et al. (2002), Wells et al. (1993) and Bell (2006) showed that farmers' perception of the prevalence of lameness in a herd was lower than that of a researcher who observed all cows individually, looking for lameness. It is possible that as a result of this type of underestimation, farmers do not consider lameness a large enough problem to warrant much attention, particularly in view of all the other demands on their time and effort. Increases in herd size and the cost of labour mean that the ratio between cows and staff on farms has increased considerably over recent years (Defra, 2009), which increases pressure on staff time. Recent low milk prices have made financial margins very small for UK farmers, particularly in 2007–2008 (Defra, 2009), and this may have restricted the actions they have felt able to take. Other health issues, such as mastitis, have a more immediately obvious cost, with a direct effect on milk price and amount of saleable milk (Blowey and Edmondson, 2000), and this may attract farmers' attention or investment, at the expense of lameness. Other possible contributing factors are that farmers lack information on how to control lameness, or that current advice is not being followed, or is not effective.

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The aim of this study was to investigate what is preventing progress in the control of lameness on UK dairy farms. A face to face questionnaire approach was used with 222 dairy farmers in the UK to investigate their perceptions of lameness and its implications in their own herd, as well as what might limit their ability or effort to control lameness. Specific hypotheses explored were:

(1) farmers are not aware of the number of lame cows on their farm,
(2) farmers do not perceive lameness to be a large problem on their farm,
(3) farmers are not aware of the cost of lameness to the farm business,
(4) lameness is not the top priority for investment of effort in improving herd health,
(5) time and labour are limiting factors for lameness control activities,
(6) financial constraints prevent lameness control activities,
(7) knowledge and information of techniques for lameness control are lacking.

2. Methods

The study was carried out between October 2006 and May 2007, as part of a larger intervention project, described by Barker et al. (2010). The majority of the 222 farms involved were recruited through contact with UK milk buyers. A small proportion (12%) were recruited directly using the telephone directory. Thirteen were in Wales and the remainder were spread across the south and midlands of England. Prior to this study, in 2006, a pilot study on the subject of lameness and its impact and control had been carried out with 50 farmers from five different EU countries. The results of this were used to guide the design of the current questionnaire. Each farm was visited by one of four researchers. Prior to the farm visits the researchers had been trained together in the use of the lameness scoring method (Table 1), and the delivery of the questionnaire. The lameness scoring method has been fully described by Barker et al. (2010).

At the farm visit, a face to face interview was carried out with the owner or a member of the farm staff, depending on convenience for the farm. The person answering the questions will be referred to as "the farmer". Herd statistics for the previous year were collected, including average herd size and number of fulltime equivalent personnel working with the dairy herd.

Table 1
Definitions of lameness scoring categories used by researchers.

Score	Description
0	Sound –Walks confidently, with even weight on all four feet –"Tracks up" (hind feet in prints of fore feet – best visible from the side) –No swinging of legs inwards or outwards (best observed from behind)
1	Imperfect locomotion –May walk cautiously, possibly due to tenderness –OR does not track up –OR legs swing out or in BUT no obvious limp.
2	Lame –Definite limp (foot fall uneven, dew claws on affected limb do not drop as far) –OR arched spine. A favoured limb will move more quickly than the lame limb. Speed of walk not noticeably affected.
3	Severely lame –Cannot walk as fast as a brisk human pace –The animal shows obvious signs of limb pain (e.g. reluctant to bear weight, very obvious shifts in body posture)

Farmers were asked how many lame cows there were in the milking herd on the day of the visit (used to calculate Farmer Prevalence of lameness: FP), the scale of their lameness problem (major, moderate, or minor) and the proportion of the herd which had been lame in the past year (used to calculate incidence). If records were not available to supply incidence data, an exercise using photographs of foot lesions as prompts was used, to gain an estimate of the number of cows affected by different lesions in the past year. The farmer was shown photographic illustrations of a range of foot lesions and asked to estimate how many cases of each type of lesion had been found in cows in the herd during the past year.

Farmers were asked to name their three greatest herd health concerns and rank these, first in terms of the effort put into control, and then in terms of the cost to the business, during the past year. If lameness had not received the most effort, farmers were asked why this was the case. They were also asked to estimate the cost of lameness to the farm business in the past year. Because it was expected that farmers would find it difficult to supply a cost figure, and would think about it in different ways, they were also asked about the components they would consider in calculating the cost, even if they were not able to give a figure. The total cost estimate was later divided by the incidence reported by the farmer to give a cost per case of lameness, which could be compared with published figures.

Next, farmers were asked to consider what prevented them from doing more to reduce lameness and to classify 10 possible reasons on a scale from 1 (not important in preventing action on lameness control) to 5 (extremely important). These reasons were: lack of time; limited amount of labour; lack of skilled labour; lack of reward; poor foot trimming facilities; solutions are not affordable; lack of knowledge/information; conflicting advice; unpopular tasks are involved; other issues take priority. Farmers were also asked about any information or advice they had received on lameness control over the past 2 years, whether they had followed it and, if not, why not.

The researcher assessed the locomotion of the entire milking herd on the day of the farm visit, to give a point prevalence figure for lameness. This was done by watching the cows as they left the milking parlour and assigning each one a score on a scale of 0–3 (Barker et al., 2010), as shown in Table 1. Cows scored 2 or 3 were classified as lame. The percentage of the herd in each score category was calculated. The percentage score 2 and score 3 were added to give the Researcher Prevalence of lameness (RP). Data on RP and the percentage scored severely lame (score 3) by the researcher (RP3) were compared with the farmers' statements of the prevalence of lameness in the herd (FP) prior to the scoring session.

2.1. Statistical analysis

The mean, standard error of the mean, standard deviation, median and range were calculated for FP, RP, RP3, (RP–FP) and (RP3–FP). Quartiles were also calculated for (RP–FP) and (RP3–FP) for use in boxplot illustrations. The percentages of farmers describing their herd lameness problem as "major", "moderate" and "minor" were calculated. The full descriptive statistics were calculated for FP and RP in each of these subgroups and again illustrated in boxplots. The ways in which farmers ranked health problems in terms of the effort put into controlling them, and the cost to the business, were summarised by calculating the percentages of farmers ranking each health issue highest on each of the two attributes, cost and effort, respectively. Data on the importance of barriers to lameness control were summarised by calculating the percentage of farmers who rated an individual barrier at each of the five possible levels given.

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Statistical analysis was carried out using SPSS Version 16. The Kolmogorov–Smirnoff test was used to test variables for normality, and parametric or non-parametric tests chosen accordingly. The prevalence of lameness detected by farmers and researchers was compared using Wilcoxon's signed rank test. FP was compared with both RP and RP3. The correlation between FP, RP and RP3 was tested using Spearman's Rank correlation. Correlation was also used to test whether the discrepancy between FP and RP was related to either herd size (Spearman's Rank correlation, since the herd size distribution was skewed towards lower values) or cow:-staff ratio (Pearson's correlation coefficient). The prevalence of lameness on farms where the farmer described the problem as minor, moderate and major, was compared using the Kruskal–Wallis test, since the prevalence of lameness reported by farmers had a skewed distribution. The correlation between farmers' ranking of health issues, in terms of effort put into their control and cost to the business, was also tested using Spearman's rank correlation coefficient.

3. Results

3.1. Prevalence of lameness as detected by farmers and researchers

Across all farms, FP was skewed towards the lower values (mean 6.9 ± 0.492%, sd 6.56, median 5.4%, range 0–49%) while RP had a normal distribution (mean 36 ± 1.25%, sd 18.7%, median 36%, range 0–79%) and RP3 was again skewed to the lower values (mean 5.4 ± 0.42%, sd 6.03, median 3.4%, range 0–31%). Fig. 1 shows FP plotted against RP, and Fig. 2 shows FP against RP3. The difference between FP and RP is illustrated in Fig. 3 with boxplots of FP–RP (mean −30.6 ± 1.22, sd 17.2) and FP–RP3 (mean 0.8 ± 0.50, sd 6.03). Values of FP were much closer to RP3 than to RP, but Wilcoxon's signed rank test showed that FP differed significantly from both RP ($z = -12.0$, $p < 0.001$) and RP3 ($z = -3.53$, $p < 0.001$). Only three farmers estimated the prevalence of lameness to be higher than that found by the researchers. For these three farms, RP was at the lower end of the range. On 68 farms FP was also less than RP3, but on 118 farms, FP was greater than RP3. There were positive correlations between RP and RP3 (Spearman's rho 0.737, $p < 0.01$), FP and RP (Spearman's rho 0.457, $p < 0.01$), and FP and RP3 (Spearman's rho 0.475, $p < 0.01$).

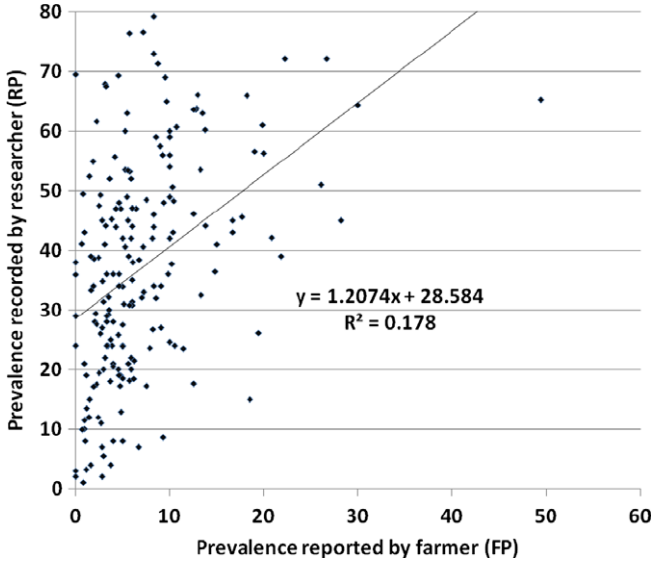

Fig. 1. Scatter plot showing the relationship between the prevalence of lameness recorded by a researcher (RP) and the prevalence reported by the farmer (FP) on 222 farms.

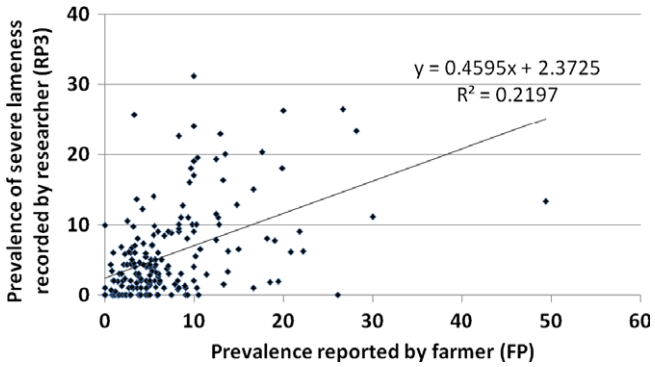

Fig. 2. Scatter plot showing the relationship between the prevalence of severe lameness recorded by a researcher (RP3) and the prevalence of lameness reported by the farmer (FP) on 222 farms.

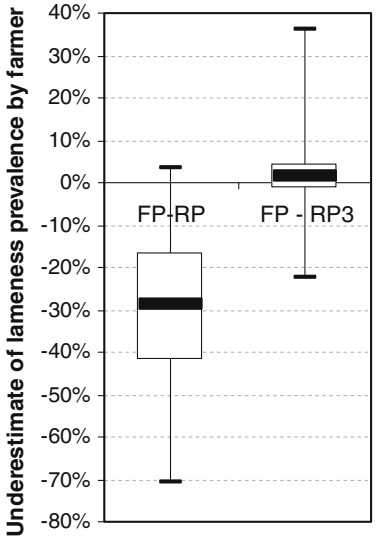

Fig. 3. Box and Whisker plots of the difference between farmer perceived prevalence (FP) and researcher assessment of lameness (RP and RP3), showing the median, quartiles, maximum and minimum values. A larger negative number represents a greater underestimate by the farmer.

There was a small but significant negative correlation between FP–RP and herd size (Spearman's rho −0.273, $p < 0.01$) and the ratio of number of cows to people working on the farm (Pearson's $r = -0.146$, $p < 0.05$). It is worth noting that the underestimation of lameness by the farmer increased with a larger herd, and with more cows per labour unit.

3.2. Farmers' description of the scale of the lameness problem

Nine percent of farmers described their lameness problem as "minor", 45% described it as "moderate", and 26% described it as "major". The remainder of the answers given did not fall into one of these three categories. The median values for both RP and FP increased across the groups in the order "minor problem", "moderate problem", "major problem" (Fig. 4), and the medians between the groups differed significantly for both measures (RP Kruskal Wallis $p < 0.001$; FP Kruskal Wallis $p < 0.01$). There was a very wide range in FP and RP within each of these groups of farms (Fig. 4). For example, for problems described as "minor", FP ranged from 0% to 10% while RP ranged from 0% to 79%.

The mean incidence of lameness reported by farmers was 36.4 ± 2.5 cases per 100 cows per year, sd 20.1 (median 20, with a range from 0 to 100).

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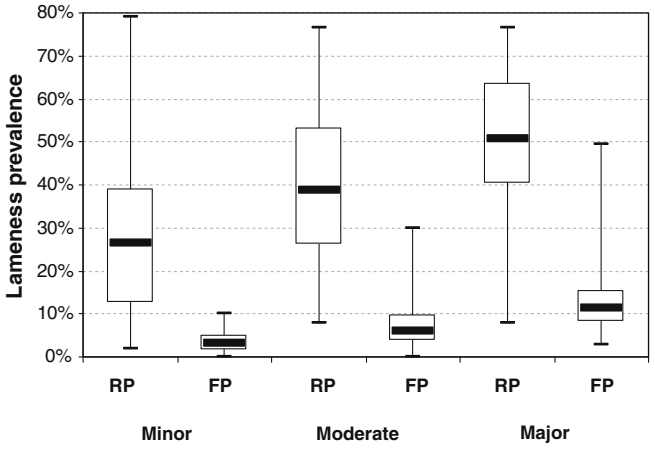

Fig. 4. Box and Whisker plots of the prevalence of lameness reported by the researcher (RP) and the farmer (FP) in herds where the farmer described the lameness problem as minor ($n = 58$), moderate ($n = 100$) and major ($n = 20$). The graph shows the median, quartiles, maximum and minimum values.

3.3. Relative priorities of different herd health issues

Two hundred and thirteen farmers ranked their effort put into controlling different herd health issues. Most often, the greatest effort was put into mastitis control (42% of those answering), while 20% and 19% said they put most effort into fertility and lameness control, respectively. Additionally, 14% ranked lameness and either mastitis or fertility equally in first place. Six percent of respondents were most concerned with a different disease, usually a calf disease or bovine tuberculosis. The question "If you have ranked another herd health issue higher than lameness, in terms of the effort you put into controlling it, why is this the case?" was answered by 149 farmers and the results are summarised in Table 2. Fifteen percent of responding farmers said it was because their herd had little or no lameness problem. For these farms, the median FP was 3.1% and the median RP was 24%. In addition, 20% said that another health issue was "a bigger problem"; the median FP and RP for these farms were 4.6% and 30%, respectively. Thus, for 35% of those giving a reason, perception of the relative scale of herd health issues meant that less effort was put into lameness control than other issues. Additionally, 25% stated that the cost of another health issue was greater, more obvious, or more immediate than the cost of lameness. The next most common reason for averting effort from lameness control was a specific concern about fertility, based on the fact that "cows must get in calf to produce"; this was mentioned by 11% of respondents. The remaining reasons were mainly related to the nature and implications of mastitis control. Six percent said that mastitis control was easier as it was "more part of the routine", while 2% said that lameness control took more time. The facts that mastitis can kill cows and is contagious were also mentioned.

3.4. Estimation of the cost of lameness by farmers

Only 30% of respondents gave an estimate of the cost of lameness to the farm over the past year. These ranged enormously, from £50 to £40,000 per year at the herd level, which, when adjusted for herd size, equated to £0.62 to £160 per cow in the herd per year. Dividing by the farmer's report of the number of lameness cases in the past year, to allow comparison with published figures for the cost of a single case of lameness, gave a mean cost per incident reported of £104 ± £14.2, sd £114 (median £54, range £2 to £520). However, it should be noted that the number of incidents is very likely to be under-reported, (Bell et al., 2006). Using the true incidence as the divisor would reduce the cost per case.

Table 2
Farmers' explanations for why they put less effort into controlling lameness than other herd health issues. (Farmers could give more than one answer.)

Issue	Percentage of 149 farmers mentioning the issue
Relative perception	
Another disease is seen as a bigger problem	20
Lameness is not a big problem	15
"Mastitis is more obvious"	6
"Mastitis is understood better"	3
Lameness has a less obvious effect on production	3
"Lame cows can get overlooked"	3
Practicalities	
Mastitis control is easier, more in the routine	6
Lameness control takes more time	2
Mastitis is contagious	1
Practicalities/financial implications	
Cows must get in calf	11
Mastitis can kill cows	3
Financial perception	
Cost of another health issue is greater	11
Mastitis has more immediate effects on profit	5
Mastitis has more obvious effects on profit	5
Lameness improvement needs investment	3
Lameness is not an obvious cost/hard to cost	3
Fertility cost is more obvious	1

One hundred and eighty-eight farmers answered the question "what components would you include if calculating the cost of lameness?", and the components they mentioned are illustrated in Fig. 5.

Loss of milk was the component of the lameness costs most frequently mentioned by farmers, followed by treatment. A reduction in fertility was mentioned by 32% and the cost of culling chronically lame cows by 24% of farmers. Other costs referred to were foot trimming (17%), loss of condition in lame cows (12%) and the need for footbathing to control lameness (10%).

Farmers found it easier to rank their three main herd health concerns in terms of cost than to supply a cost figure, or the components they would take into consideration if calculating the cost. Two hundred and five farmers provided a ranking figure for some of their herd health concerns. Twelve percent of these did not consider lameness to feature in the top three issues for cost. Eighteen percent ranked lameness as the health issue costing most (there were six cases of joint ranking with another condition). Forty-six percent and 26% ranked lameness second and third, respectively. In contrast, 42% of farmers ranked mastitis highest, and 29% ranked fertility highest.

There was a significant correlation ($p < 0.01$) between the ranking farmers gave to a health issue in terms of effort put into control, and the ranking in terms of cost to the farm business (lameness Spearman rho 0.496, mastitis Spearman rho 0.513, fertility Spearman rho 0.511).

3.5. Farmers' views on barriers to lameness control

When farmers rated the suggested barriers to lameness control, limits to time and labour were the issues most often described as "very important" or "extremely important" (Fig. 6).

Four percent of farmers considered none of the suggested barriers were any more than "slightly important".

3.6. Advice sought on lameness control and other health issues

Forty-three percent of farmers had been given or sought advice or information on lameness control in the past 2 years. The sources of this information are summarised in Table 3.

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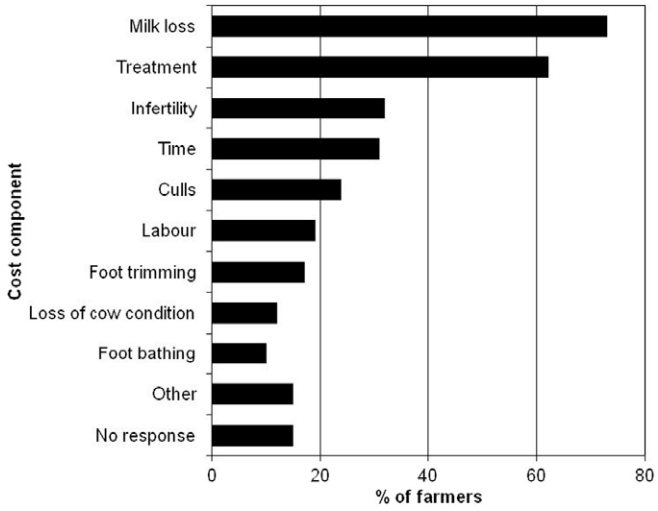

Fig. 5. Percentage of farmers including different components in their considerations of lameness costs.

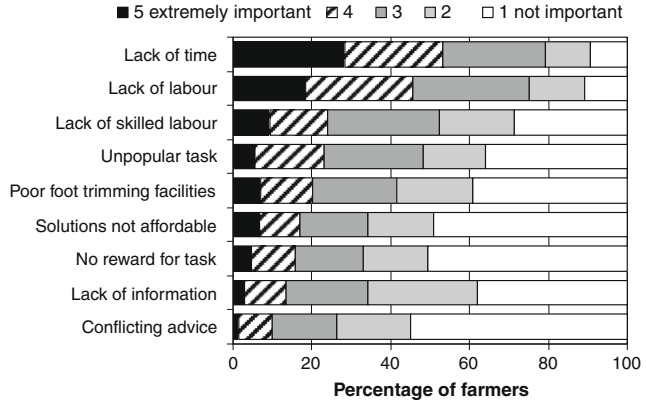

Fig. 6. Percentage of farmers considering the suggested barriers to lameness control "extremely important" to "not important".

Sixty percent of the farmers seeking information had followed at least one new lameness control idea, but 58% had failed to implement at least one of the suggestions they had received for lameness control (the number of suggestions ranged from one to three). Eighteen percent had ignored all lameness control suggestions, and 21% had followed all the suggestions received. The most common reasons given for ignoring lameness control suggestions were the cost (22 instances), lack of time or labour (16), lack of the necessary resources (13), and lack of interest or confidence in the suggestion (14).

Table 3
Sources of information on lameness control used by farmers.

Source of advice	Percentage of farmers
No advice or information sought	57
Vet	15
Farmer's own ideas	10
Discussion group	7
Foot trimmer	5
Sales representatives	5
Farm staff/other farmers	4
Written materials	4
Nutritionist	1
Other	2

4. Discussion

The purpose of the study was to investigate the reasons why lameness control is not improving on dairy farms, despite much recent research. There is of course the possibility that the findings of the research are not relevant to practical situations, or have not been correctly interpreted or translated into practical recommendations. There is still a limited understanding of many risk factors, and particularly interactions between them (Dippel et al., 2009). However, this paper concentrates on understanding some of the aspects of farmers' views and priorities which might limit their progress in lameness control. The original hypotheses will be discussed in turn.

In agreement with previous studies (Wells et al., 1993; Whay et al., 2002) there was considerable support for the hypothesis that farmers are not fully aware of the numbers of lame cows in their herds. However, the large range of difference between FP and RP indicates that there is great individuality in the way farmers perceive lame cows. The two most likely sources of discrepancy between FP and RP are considered to be differences in the definition of a lame cow, and the fact that the researcher was concentrating on the specific task of assessing gait in every cow being milked, while the farm staff have other tasks and responsibilities, particularly as cows pass through the parlour. The first hypothesis is supported by the closer relationship between FP and RP3 than between FP and RP. Some farmers disagreed with the researcher on whether a particular cow should be described as "lame". Where there is a high prevalence of lame cows, the farmer may become habituated to seeing them, and unfamiliar with the "normal" gait of a sound cow. The possibility that farmers are distracted from noticing cows by other tasks, is supported by the finding that in a situation where farmers and researchers scored the same cows simultaneously, the agreement was closer (Bell, 2006). Another possible contribution to the discrepancy is that when asked how many lame cows there are, people call to mind the cows recently treated as the current "lame cows" and forget that cows treated longer ago in fact have not yet recovered (Bell et al., 2006). It may also be that in some cases the questionnaire was answered by someone who did not see the cows on the same day as the researcher, and was not truly aware of the current situation.

Failure to detect all the lame cows will result in farmers perceiving the lameness problem to be smaller than it really is and giving it less attention. Records of incidence were limited, as other studies have found (Mill and Ward, 1994) and unlikely to have been reviewed by farmers (Bell et al., 2006). Limited recording of lameness reflects, and also is likely to promote, the farmers' impression that lameness is not important. Bell et al. (2006) showed that failure to review records was associated with a higher prevalence of lameness. Other populations of farmers have shown a similar apparent acceptance of current lameness levels. In an EU survey, when farmers were asked what would make them increase their efforts in lameness control, the majority replied "a bigger problem" (Leach et al., 2010), and when Edgecomb et al. (2006) surveyed 350 Michigan dairy farmers, less than half agreed or strongly agreed that lameness was a problem.

This study has provided some support for the hypothesis that many farmers are not aware of the cost of lameness to the farm business and do not realise the full implications of their lameness problem in terms of productivity or profitability. The fact that only 30% of farmers were willing or able to make an estimate of the cost of lameness suggests that many fail to consider the economic impact of lame cows on the business. This is despite figures on the cost of lameness in the UK having been available for at least 25 years, and periodically updated (Baggott and Russell, 1981; Whitaker et al., 1983; Esslemont and Spincer, 1993; Esslemont,

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2005), although, admittedly, costing lameness is complex. Some farmers who are aware of the figures may lack confidence in them, or feel they are not relevant to their own herd (Huijps et al., 2008). In Esslemont's costing, milk loss and culls each accounted for 34% of the total costs of lameness, with treatment costs (materials plus time and vet charges) contributing 17%. It is interesting to compare this ranking with the frequency with which these three components were mentioned by farmers. Costs of culling were rather under-represented, and costs of treatment and time spent working with lame cows over-represented, in the farmers' views. The estimated average cost per case of lameness derived from a small subsample of the farmers included very many sources of variation, from differences in the components included to inaccuracy of both the total figure and the incidence of lameness (likely to be underestimated), resulting in an enormous range from £0.62 to £160 per cow per year. This suggests there is a great deal of uncertainty among farmers about the information. To put the figure in context, while admitting its lack of accuracy, the average total variable costs per cow for 2006–2007 on English dairy farms were calculated to be £1345 (Defra, 2007) and the full cost of an average case of lameness estimated by Esslemont in 2005 was £178.23. Several farmers gave the lack of transparency of cost, compared with that of mastitis (Yalcin et al., 1999) as a reason for investing less effort in lameness control than in mastitis control.

The results show clearly that, as well as perception of the "absolute" scale of the lameness problem, the farmer's perception of lameness relative to other herd health issues has an important influence on the effort dedicated to lameness control. With limited time and resources, for both decision-making and action (Llewellyn, 2007), farmers naturally prioritise, and lameness control is not always given top priority. Mastitis and high somatic cell counts in particular have an immediate and visible cost (Yalcin et al., 1999), and are generally high on farmers' lists of disease priorities (Leach et al., 2005) while maintaining fertility is vital for continued production. Among 52 UK dairy farmers with over 35 cases of mastitis per 100 cows per year, 77% considered that mastitis cost them more than any other disease (Leach et al., 2005). Bell et al. (2006) reported that high priority was not consistently given to lameness even on farms nominated as "problem farms" by veterinary surgeons. On herd health plans there were consistently more measures in place for mastitis than for lameness control. In the current study, it appeared that some farmers saw lameness as practically more difficult to control than other health issues, and to require more control actions which were separate from the daily routine, compared with mastitis.

Herd health overall competes with many other priorities for farmers' time, resources, and decision-making opportunities (Kristensen and Enevoldsen, 2008), and in this study limits to time, labour and expenditure were shown to restrict lameness control activities. Many farmers gave the impression that they felt unable to increase their efforts in lameness control, frequently mentioning limited time and labour, both as general barriers to increasing lameness control activity, and barriers to implementing particular lameness control advice. On UK dairy farms the number of cows per labour unit has been increasing relentlessly in recent years (Defra, 2009). Detecting and treating lame cows promptly and effectively requires time and effort, and pressures on labour may be reducing farmers' capacity to do so. This is not a new issue, since even in the small study carried out by Mill and Ward in 1994, six out of 15 farmers said they would delay treating a lame cow due to shortage of time. Cost was given as the primary reason for not implementing lameness control suggestions. In winter 2006–2007, when the survey was carried out, UK milk prices had been generally in decline for some 5 years, and the typical price was 17.2–18.5 pence per litre for conventionally produced milk. Over this period, dairy farmers have also been facing increasing costs (Defra, 2009).

Perceived lack of knowledge or information, although reported by a small proportion of farmers, was not shown to be preventing the majority from tackling lameness in this study, in contrast to the situation reported by Mill and Ward in 1994. There has been a large amount of applied research in recent years (e.g. Cook et al., 2004) and this has begun to be disseminated through the farming press, websites, and meetings and events for farmers (Balsom, 2009). It is interesting that in the survey reported by Mill and Ward (1994) only one farmer thought that cubicle comfort would influence lameness, yet current research shows that this association exists (Cook et al., 2004; Dippel et al., 2009), and many farmers are now aware of the fact. It is likely that farmers' knowledge on lameness has increased since 1994, although the present study does not allow us to test whether the relationship between level of farmer knowledge and level of lameness, clearly identified by Mill and Ward in 1994, still exists. Very few farmers gave high importance to lack of information or conflicting advice as restrictions to tackling lameness. For some this might be because they trust their own knowledge more than that of others, as shown in the case of oestrus detection by Garforth et al. (2006). However, over 40% of farmers had sought or received information about reducing lameness from a variety of sources in the past 2 years, although not all of this information had been put into practice.

Another possibility for the lack of input into lameness control, which this survey did not address, is that farmers do not fully understand the welfare implications of lameness for cows. Although the majority of farmers agree that "pain and suffering for the cow" is an important outcome of lameness (Mill and Ward, 1994; Leach et al., 2010), this claim of concern does not always result in practical action. Austin et al. (2005) mentioned that some farmers may perceive productivity and welfare to be in conflict since achieving better welfare can be costly, but not lead to a premium for the product.

5. Conclusions

In summary, the postulated barriers appear to contribute to limiting progress in reducing lameness in dairy herds, with the exception of lack of information and knowledge. From this study it appears that farmers underestimate the extent of lameness and the implications for the performance of their cows and their business, while restricted time, labour and finance all present real obstacles to change.

There is a need to encourage farmers to give a more appropriate order of priority to lameness control, among all the demands upon them. The limitations of time and labour are likely to increase in the current economic climate, so the practical steps taken will need to be possible within these constraints. Any solutions for lameness which can be shown to have additional benefits for other issues have the greatest chance of being implemented.

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