CATTLE MOBILITY: Changing behaviour to improve health and welfare and dairy farm businesses

Final Report – December 2013

SUMMARY

This research project investigated the impact of the DairyCo Healthy Feet Programme on dairy cattle lameness in North West England. It also used interview questionnaires to elucidate the motivations and barriers that farmers experience in tackling lameness as a problem and their perceptions of the economic impact that lameness has on their farm business.

The research used a group of 24 Plan Farms (that implemented the control programme with the support of their vet) and 21 Control Farms (that did not implement the intervention and were not encouraged to take any additional actions on lameness). All farms were tracked over the year of plan implementation by mobility scoring cows on 5 occasions. Interview questionnaires were used to gain the opinions and attitudes of the participating farmers.

Main findings

> ➢ The DairyCo Healthy Feet Programme reduced the average prevalence of lameness on 24 Plan Farms by 20% in the first year of implementation (from 32% score 2 + 3 at the start to 25% at the end).
> ➢ Large decreases in the prevalence of lameness are possible within a 12 month period (the top quartile in this regard reduced lameness by 52%, from a prevalence of 37.5% at the start of the project to 17.5% at the end of the implementation year).
> ➢ All farmers in the study recognised the importance of lameness as an issue for the British Dairy Industry (calling for a national target of below 10% lameness prevalence).
> ➢ Tackling lameness is a choice. The most successful farmers were more confident in implementing change and had more control of the situation. The Healthy Feet Programme raised their awareness, knowledge and understanding of the issues and how to practically resolve them. They had the same managerial, technical and financial barriers to change as the least successful farmers, but their attitude was to view these as 'barriers' to a lesser extent.
> ➢ The annual cost of lameness to the business was on average £26,400 per 100 cows at the start on the research year. At the end of the year, the Plan

Farms had reduced this cost to an average of £20,625, and the best quartile had reduced it from £30,938 to £14,438 per 100 cows.

➤ All farmers could generally identify the reasons why lameness was a cost to their business, but they were also generally all poor in predicting what this cost was.

➤ The DairyCo Healthy Feet Programme is an approach and contains tools that can change behaviours and reduce lameness. However, the ability to reduce lameness is at least in part influenced by the prevailing beliefs of those managing cows on farm.

1. RATIONALE

The project conducted research to measure the impact of the DairyCo Healthy Feet Programme (DHFP) on lameness in dairy cattle and the behavioural change of farmers and farm managers that is required to gain the animal health and welfare, cost reduction and production output benefits. This process approach to mobility improvement has never before been tried in the UK.

The DHFP was launched in September 2011. RDPE Skills funding has been and is used in different parts of England to support the implementation of the DHFP on farms, but there is currently no provision to research the actual impacts of the process in terms of mobility improvement, business profitability and mind-set change.

The prevalence of lameness in the national dairy herd is estimated at 20 to 30%, i.e. the number of cows scoring 2 or 3 on the DairyCo Mobility Score scale of 0 (no lameness) to 3 (severely lame) is between 20 to 30%. The incidence rate is approximately 50 to 75 cases per 100 cows per year. The average cost of a case of lameness is approximately £330, so for an average herd of 150 cows, lameness treatment costs in the region of £24K to £36K per annum. These figures represent lame cow treatment costs, reduced production and fertility and increased risk of culling. The DairyCo Healthy Feet Programme aims to reduce the incidence of lameness by improving mobility, and this research will make the programme more accessible and successful for farmers.

The market opportunity exists in savings on farm and increasing uptake of the Programme. If 200 of Cheshire's 620 dairy farms implement the plan over a 3 year period after the research, then the business opportunity for plan implementation is approx. £300K and for potential on-farm savings would amount to approx. £1.2M per annum.

The original application form and project management plan are shown in Appendices 1 and 2, respectively.

2. OBJECTIVES

The project had three distinct objectives. Addressing these in turn will form the main structure of this report:

2.1 Objective 1 – Measure the impact of the DairyCo Healthy Feet Programme (DHFP) on mobility in dairy cattle.

2.2 Objective 2 – Understand the motivations and barriers to implementing management changes on-farm that improve cattle mobility.

2.3 Objective 3 – Evaluate the cost savings and business benefits arising from mobility improvement.

3. RESEARCH APPROACH

3.1 Plan and Control Farms and the mobility interventions.

The approach taken for this applied research project was simple. The aim was to engage 20 farms in the North West with the DairyCo Healthy Feet Programme (DHFP) over a 12 month period (July 2012 to July 2013) – these were the 'Plan Farms'. The DHFP was the mobility intervention on these farms, a summary of which is shown in Appendix 3.

Five mobility scores were undertaken on these farms over the course of the year; one at the start and one at the end, with the middle three at regular intervals over the 12 month period. These were carried out by the Mobility Mentors (MMs - vets) or trained scorers from the veterinary practices of the MMs.

The project used the DairyCo Mobility Scoring system (0, 1, 2 and 3). Scores 2 and 3 were classed as 'lame', 0 and 1 as 'not lame'. Great care was taken that all scorers were trained to a consistent level, using the DairyCo Mobility Scoring DVD, external training days and regular comparison between scorers. In addition, we ensured that the same person scored any individual farm at each occasion through the year, wherever possible.

There was also an aim to engage 20 Control Farms, where no interventions were encouraged and which did not implement the DHFP. These farms were all clients of the project partners Lambert Leonard and May (LLM – part of XLVets) in the North West. These farms also had mobility scores conducted at five times during the same 12 month period as the Plan Farms. The scorers were two trained employees of LLM.

It is important to note that all efforts were made not to influence mobility management on these Control Farms; the intention was to gain data from these enterprises as real 'controls' and any influence on their practices during the year would have detracted from the important premise that they could be compared with the Plan Farms which implemented the DHFP. To this end, the Control Farms did not receive the mobility score results until after the end of the 12 month period and after the farmers had been interviewed (see below). The scorers were also briefed and careful not to discuss the project or lameness with anyone that they interacted with on the farm. The farmers engaged as Control Farms were also briefed on this approach so that they understood the necessities involved. There was also no publicity on the project undertaken during the main 12 month measurement period (as advised by the Steering Team), so that no detailed awareness could be gained.

3.2 Actual outcomes with engaged Plan and Control Farms

There were 24 Plan Farms engaged with the project. These were covered by eight MMs. The broad details of the farms are shown in Appendix 8. Not all farms had five mobility scores carried out during the 12 month period of the project, but all did have a 'start' and 'end' score and had at least 4 mobility scores. All farms completed start and end interview questionnaires (see below) bar one farm where the manager left during the project period. This one farm had mobility scoring data and a start questionnaire, but no end interview questionnaire.

There were 21 Control Farms engaged with the project. These were all interviewed at the end of the project, but it should be noted that two farms were overseen by one owner, who completed the end interview on behalf of both enterprises, meaning that 20 end interview questionnaires were completed. The broad details of the farms are shown in Appendix 8.

The analysed data from the mobility scores is shown in Appendix 4.

3.3 Interview questionnaires

In order to get detailed data to meet the second and third objectives of the project (motivations/barriers and costs) and also to measure awareness of mobility/lameness issues on Plan and Control Farms, two questionnaires were devised (by the project management team with advice from the project Steering Team) and implemented. The questionnaires were a mixture of open questions (with free-answers given and recorded) and closed questions where interviewees were asked to quantify their response or opinion.

The first was a 'start' questionnaire for the Plan Farms; this is shown in Appendix 5. This enabled the project team to measure the understanding of lameness on these farms at the start of their DHFP implementation and the analyses of data are shown in Appendix 6. These questionnaires were facilitated by the MMs.

The second interview questionnaire was conducted at the end of the 12 month measurement period and was a more extensive investigation for both Plan and Control Farms of understanding, motivations, barriers and feedback (for Plan Farms) on the DHFP. Comparison of data between the start and end interview questionnaires on the Plan Farms also enabled an impression to be gained of the development of understanding around lameness on these enterprises.

All questionnaires were conducted with those that had been identified as having involvement with mobility control on-farm and who lived/worked full time on the farm. This could be the owner, manager or herdsperson. Thus for the end questionnaire, two people were interviewed on four of the Plan Farms.

The end interview questionnaire was conducted face-to-face and on-farm for both Plan and Control Farms. The interviews were all carried out by one person (Lisa Forbes) who worked as a knowledge transfer officer in the Reaseheath Agricultural Development Academy at Reaseheath College. The end interview questionnaire is shown in Appendix 7, with the analysed results in Appendix 8.

3.4 Post project mobility score

As intervention on lameness and treatment of specific cases can take four to six months to have a positive outcome, and the research for this project only lasted a year, it was decided to offer a post-project mobility score to all the Control and Plan Farms in order to track if changed had happened in the months after the project. These were undertaken in November and early December of 2013; that is, four to five months after each farm has their last mobility score, which was used as the 'end' score for the purposes of data analyses. The results are referred to in section 4.1.5 below and in Appendix 15.

3.5 Statistical analyses

The details of the statistical analyses are presented in Appendices 4, 6, 8 and 9. The project had a limited data set, so the application of statistics was limited and many of the answers to quantity type questions, where interviewees were asked to score their response, were presented as a plain average (mean), or a mean with a standard error, without analysis of variance; the variance is such a small set of farms was mostly too high to gain a 'statistical difference'.

However, some of the data did lend itself to further detailed statistical analyses and where relevant (for example, the lameness scores, the lesion quiz scores and lameness costs for Plan vs Control Farms) these were analysed using a standard two-way t-test, expressing standard error of the means and significant difference. The start and end of project lameness data for Plan and Control Farms were also pooled and ranked from lowest to highest. This ranking was then analysed using the Mann-Whitney 'U' test to show differences between the two sets of farms; this data is shown in Appendix 4.

For analysis of the cost of lameness, the Steering Team reviewed the industry standard methodology for assessing the financial / business impact of cattle mobility and agreed the model:

- The average cost of an incidence of lameness (scores 2 and 3) is £330 per case. This includes:
  - Treatment costs
  - Lost revenue from reduction in milk yield
  - Culling
  - Reduction in cow fertility
- This average cost of incidence recognises that the above factors result in a per case cost by type of lameness as follows:
  - Digital dermatitis - £75
  - White Line disease – £330
  - Sole Ulcer - £550
- The mobility score provides a snapshot measurement of the prevalence of lameness in a herd. The prevalence multiplied by 2.5 provides a model of incidence in a herd over a 12 month period.
- For example, in a 100 cow herd, a MS showing a prevalence of 40% cows at scores 2 and 3 indicates an incidence of 40 x 2.5 = 100 cows per year. At £330 per case, this equates to a cost of £33,000 (£330 x 100).

After reviewing all the initial data, the project Steering Team wanted to see comparisons of the 'best', and 'worst' performing farms in terms of lameness control. In order to do this the data were re-analysed (where appropriate) for:

- The ten farms with the highest average lameness over the 12 month project period vs. the ten farms with the lowest average lameness.
- The ten farms where lameness had increased the most over the 12 month project period vs. the ten farms where lameness had decreased the most.

All Plan and Control farms were grouped together for this 'quartile analysis' (so that farms from both groups could appear in any quartile) and the results are shown in Appendix 9.

4. RESULTS

The detailed results and analyses are contained in Appendices 4, 6, 8 and 9. Below are the main 'take-home' messages identified by the project staff and Steering Team:

4.1 Objective 1 – Measure the impact of the DairyCo Healthy Feet Programme (DHFP) on mobility in dairy cattle.

4.1.1   Implementing the DHFP reduced lameness by 20% over the year.

- At the beginning of the year, the overall level of lame cows (score 2 and 3) was 32%. There was no difference between Plan and Control Farms.
- The range of lameness level was 0% to 60%.
- By the end of the year, the overall level of lameness on the Control Farms was still 32%, compared to 25% on the Plan Farms.
- The score 3 cows had reduced from 7.4% to 4.7% on the Plan Farms, whereas score 3 cows on the Control Farms had stayed pretty constant at around 10%.

4.1.2   Large decreases in lameness can be made in a 12 month period.

- The ten farms that decreased lameness most over the year reduced lameness from an average of 37.5 to 17.5% (a 52% reduction).
- These ten farms were made up of 6 Plan and 4 Control Farms.

4.1.3   Plan Farms did more to control lameness.

- The 23 Plan Farms with responses made a total of 182 interventions in the last 12 months – 7.91 per farm.
- The 21 Control Farms made a total of 80 interventions in the last 12 months – 3.81 per farm.

4.1.4   There were no seasonal differences in lameness

- There were no clear seasonal differences in lameness in either Plan or Control group (see Appendix 10).
- There was slightly less lameness on Plan Farms between June and August (25.9%) compared with lameness between September and May (29.4%), but this was only just significant at $P<0.05$ and there was no difference in the Control Farms.

4.1.5   Post project mobility scores

These are shown in Appendix 15. Although not all farmers agreed to take part in these, the results suggest that the improvements in lameness prevalence seen through the implementation of the DHFP continued beyond the 12 month period and that the reduction in lameness continued.

4.2 Objective 2 – Understand the motivations and barriers to implementing management changes on-farm that improve cattle mobility.

After the DHFP had been implemented on Plan Farms:

4.2.1 *All the farmers* **recognised lameness as an important issue** *for the British dairy industry.*

4.2.2 **Plan Farms had a better understanding of lameness.** *Plan Farms showed a more accurate recognition of foot lesions (scoring 10.4/14 in a recognition test, compared with 7.4/14 for Control Farms).*

4.2.3 **Plan Farms knew their lameness rates** *(on average, Plan Farms underestimated their lameness by 4%, compared to Control Farms who underestimated lameness by an average of 36%).*

4.2.4 **Plan Farms had a more positive attitude** *to lameness control barriers and were more confident in taking action (when asked to score a series of farm and personal barriers to lameness control, Plan Farms on average indicated that each was less of a barrier than did the Control Farms).*

4.2.5 *There were different attitudes to* **what the industry should do***:*

- Farms that had the lowest rates of lameness and decreased lameness the most wanted more information to be made available by the industry.
- Farms that had the highest rates of lameness and increased lameness the most wanted more investment in farms.

4.2.6 Overall, farmers felt that l**ack of time and money were the two main barriers** to improving lameness and this was the same amongst Plan and Control farmers.

4.2.7 **Trimming feet in mid-lactation might help** *(None of the farms with the highest average lameness or those where lameness increased the most undertook a mid-lactation foot trim for their cows, whereas 50% of the farms with the lowest average lameness and 50% of farms that decreased lameness the most did trim routinely in mid-lactation). It should be noted that 'mid-lactation' was not defined temporally, other than at some time during lactation, between calving and drying off.*

4.2.8 **Farms which had the lowest average lameness levels (compared to those with the highest average lameness)**:

- were more likely to identify lameness as a problem reducing production
- gave more accurate predictions of their own herd's lameness level
- were more likely to be a block calving grazing herd
- rated having an action plan to reduce lameness more highly
- were less likely to dislike dealing with lame cows
- showed more interest in reducing lameness

- considered that barriers to lameness control were less important

4.2.9 Farms which decreased lameness the most (compared to those where lameness increased the most):

- had more formal training in foot care
- scored higher in the lesion understanding quiz
- could think of more factors which influence lameness
- rated having an action plan to reduce lameness more highly
- considered that barriers to lameness control were less important

4.2.10 All the project farmers thought that **national levels of lameness should be lower** than they are, with a target prevalence of about 10%.

4.3 Objective 3 – Evaluate the cost savings and business benefits arising from mobility improvement.

4.3.1 **Both Plan and Control farmers were inaccurate at predicting the cost of lameness** within their business (predicted costs were about 3 times less than calculated costs). Plan farmers were better at predicting costs by the end of the project, but were still stating predicted costs as 2 times less than actual. However, farmers still identified infertility, milk loss and culls as the main cost contributors.

4.3.2 The average improvement in **lameness costs** (calculated by the model – see 3.4 above) for Plan Farms was £33 per cow.

4.3.3 For an average Plan Farm of 295 cows, a reduction of £33 per cow in the cost of lameness equates to a £9,735 improvement in the business, which is a **£6.5:£1 return on a DHFP cost** of £1,500 in one year (this does not include the costs of interventions).

4.3.4 The difference in lameness costs between the farms with the highest and lowest average lameness over the year was £181 per cow; i.e. **the 'worst' farms had additional costs of £18,100 for every 100 cows** associated with lameness, compared with the 'best' farms.

4.3.5 The **negative business outcomes** scored by Plan Farms arising from poor mobility were (in order of importance):

1. Reduced fertility
2. Pain and suffering for the cow
3. Reduced profits
4. Poor public image of dairy farming
5. Reduced morale
6. Reduced milk yield

7. Poor cow condition
8. Unable to walk to grazing
9. Farm assurance failure
10. Treatment cost
11. Extra time working
12. Reduced yield of milk solids

5. PR AND KNOWLEDGE TRANSFER

5.1 **Feedback** - A feedback session for all farmers and vets involved in the project will be held on 13th November 2013.

5.2 **Press articles**:

The first piece of press to appear concerning the project appeared in December 2012 and is shown in Appendix 11. This was published in RADA news and was mailed to every farmer in Cheshire and (via an insert with 'Dairy Farmer') to every dairy farmer in Lancashire, Shropshire, Staffordshire and Derbyshire.

The second and third pieces of press KT are shown in Appendices 12 and 13 (welfare aspects of lameness, and cost implications of lameness). These will go out in RADA news (to all farmers in Cheshire only) in late 2013/early 2014.

5.3 **Informing the DHFP** – An evaluation and review session with the original instigators of the DHFP has been offered through DairyCo. This would enable the findings of this project to directly inform developments in the DHFP.

5.4 **DairyCo communications** – As project partners, DairyCo will take the lessons from this project and communicate them to their levy payers (England, Wales and Scotland). DairyCo will also communicate with the veterinary and advisory/consultancy communities, and milk buyers, as influencers of farmer decision making.

5.5 **International Lameness Conference** – A poster paper on the interim findings of the project was presented at this conference by Owen Atkinson (authored by Atkinson, Fisher and Cross.

6. COMPARISON WITH PREVIOUS WORK (TUBNEY PROJECT)

The most recent UK study to have significant similarities with this research was the 'Tubney Project', run by Bristol University (2006 – 2010). Although the Tubney Project did not work on the DHFP, it did compare lameness on farms that did/did not receive lameness control interventions.

There were many similarities in terms of results between the two projects, but the main differences between them were that the current project:

- investigated the DHFP
- looked at the economics and perception of costs of lameness in detail
- gives more detail of the farmers' understanding of lameness in a national context.

The partner vet on the project, Owen Atkinson, has made a summary of the findings from the present study and a comparison between the two projects, which is shown in Appendix 14.

APPENDIX 3 – The DairyCo Healthy Feet Programme

The DairyCo Healthy Feet Programme (DHFP) aims to help dairy farmers reduce the number of lame cows on their farms by identifying and applying the right management techniques.

Lame cows cost time and money, and are a problem not only because of potential welfare issues, but also because, like any ongoing problem, they can affect staff morale.

Lameness is a term which covers many conditions: some are caused by infection, and some by physical and management factors. An understanding of which types of lameness are present, coupled with a structured approach to tackle the underlying causes is required to tackle lameness effectively.

The DairyCo Healthy Feet Programme is a step-wise approach which will help dairy farmers make important progress towards diagnosing the problems, devising an action plan, and develop the skills necessary for long-term lameness control. Trained providers (vets or foot trimmers who have attended a specialist course) facilitate the whole process and act as one-to-one advisers, or 'mobility mentors'.

The approach is based around the 'four success factors'

 - Low infection pressure

- Good horn quality and hoof shape

- Low forces on the feet – good cow comfort and cow flow

- Early detection and prompt, effective treatment of lame cows

The delivery of the one to one service is between the mentor and the producer, whilst resources and information is provided by DairyCo to aid with understanding and actions.

The programme builds on the widely respected work of the Healthy Feet project, supported by the Tubney Charitable Trust and carried out at Bristol University Vet School. It has been developed in consultation with vets in practice and foot trimmers, as well as local and international lameness experts.

The Mobility Mentor (MM) visits the farm three times in a 12 month period. Over these visits the MM provides:

- Training to farmer and staff on lameness issues and recognising lesions.
- An assessment of the issues causing lameness on the farm.
- A prioritised action plan for taking actions to reduce lameness.
- Awareness of the costs of lameness to the farm business.
- Tools and information as necessary to support the action plan.
- Review meetings and mobility scoring to track progress.

APPENDIX 4 – Mobility scores with analyses

START AND END MOBILITY SCORES

Take home messages

- ➢ The levels of overall lameness (scores 2 + 3) at the start were not different between the Control and Plan Farms.
- ➢ Control Farms had the same levels of lameness at the end of the year that they had at the start.
- ➢ At the end of the year, Plan Farms had significantly less lameness that Control Farms (21% less).
- ➢ Levels of overall lameness (scores 2 + 3) on Plan Farms reduced by 20% over the year of applying the DHFP.
- ➢ Plan Farms had fewer score 3s at the start of the year (NS by t-test, but significant by Mann-Whitney U test) and at the end of the year of DHFP application (significant by t-test and Mann-Whitney U test).
- ➢ Over the year of DHFP application, Plan Farms reduced the % of score 2s by 15.5% and score 3s by 36.5%.

Data analysed by standard t-test

Average and range of lameness

	Control Farms (n=21)			Plan Farms (n=24)			
	Average % Lame	Range	+SEM	Average % Lame	Range	+SEM	Diff.
Start MS	32.0	10 – 60	2.29	31.9	0 – 56	2.53	NS
End MS	32.0	7 – 54	2.89	25.4	0 – 55	2.31	*P<0.05*

Average and range of score 2s

	Control Farms (n=21)			Plan Farms (n=24)			
	Average % 2s	Range	+SEM	Average % 2s	Range	+SEM	Diff.
Start MS	21.9	5 – 34	1.85	24.5	0 – 44	2.16	NS
End MS	21.7	6 – 35	1.84	20.7	0 – 38	1.81	NS

Average and range of score 3s

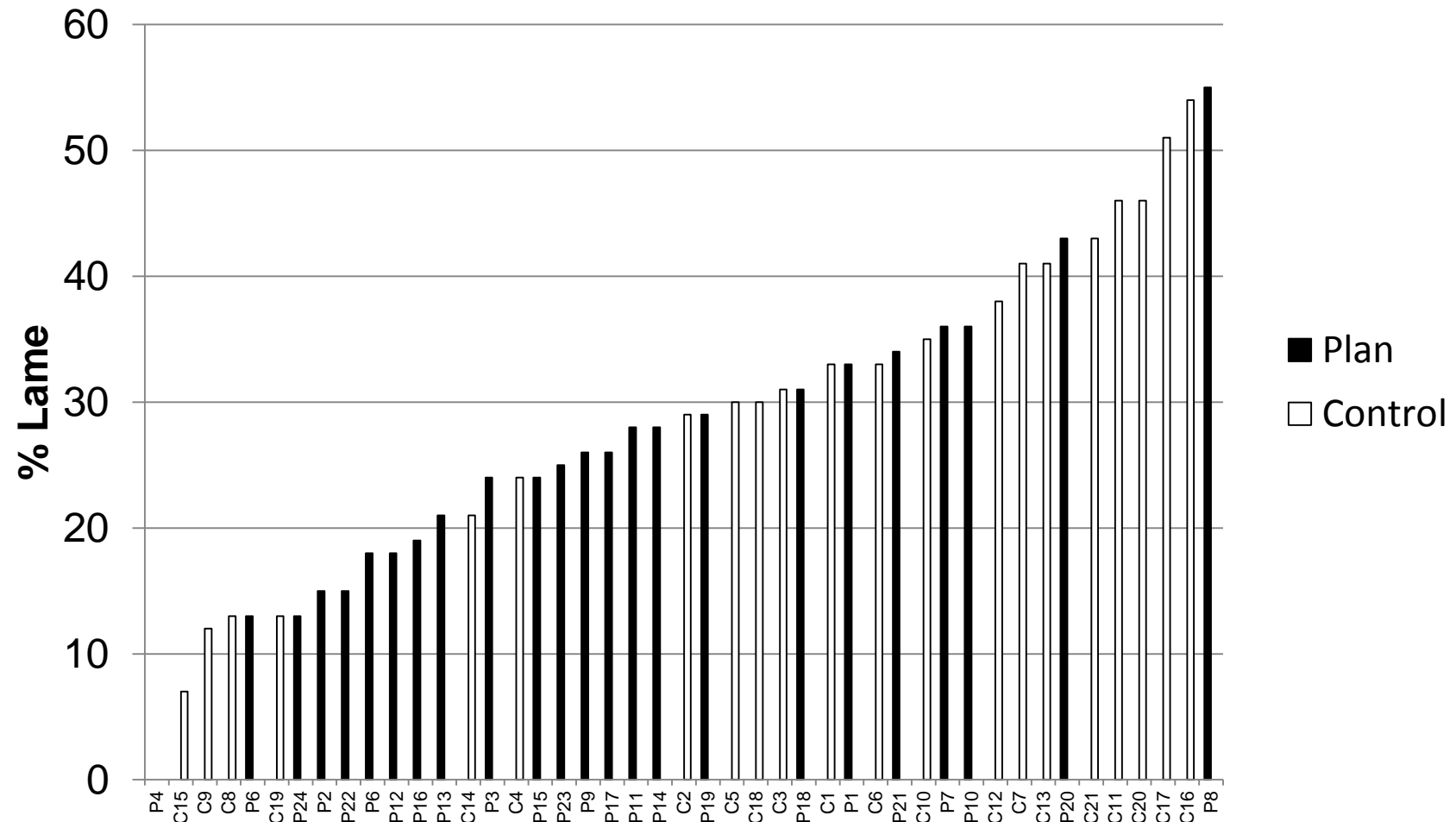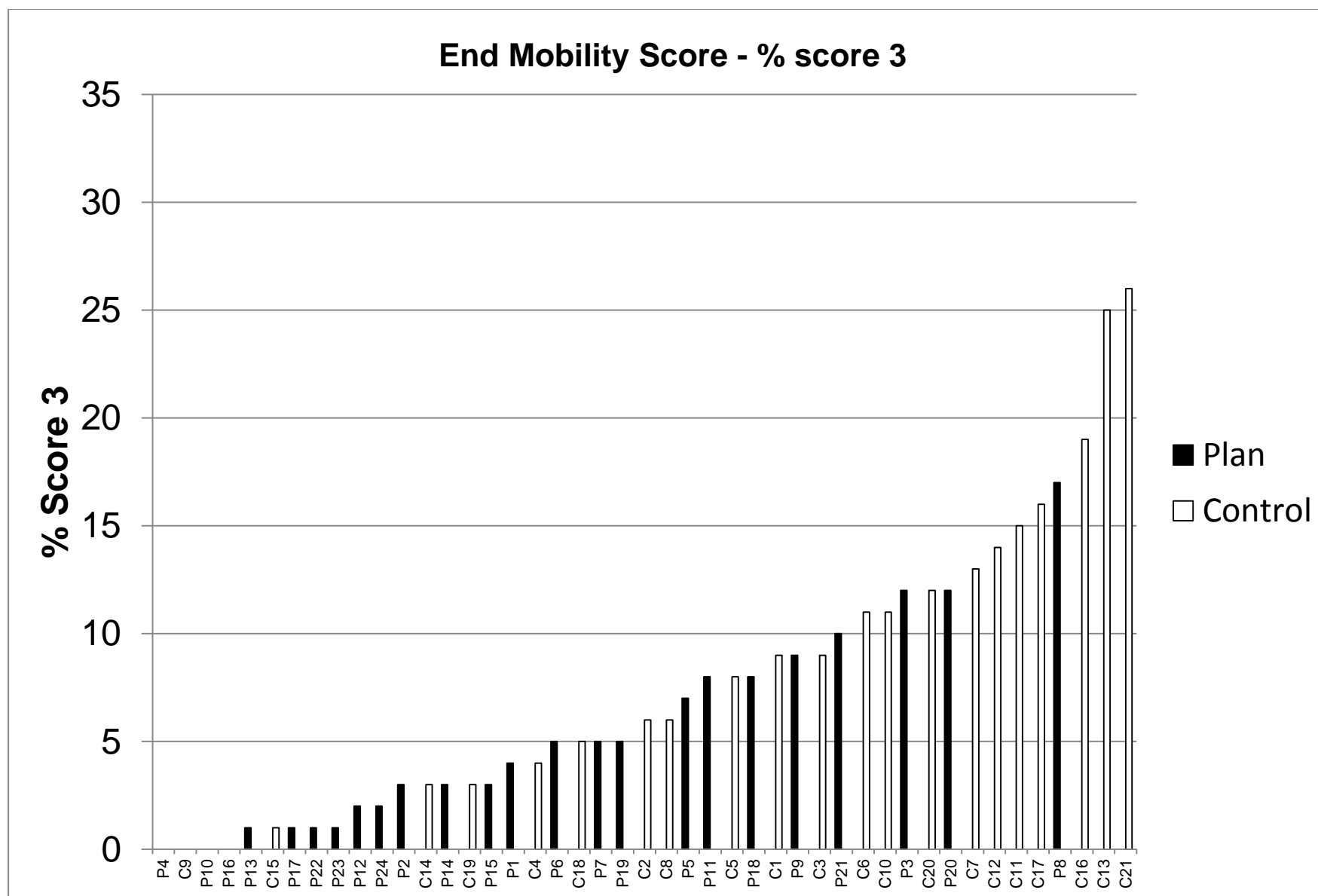|	Control Farms (n=21)			Plan Farms (n=24)			
	Average % 3s	Range	+SEM	Average % 3s	Range	+SEM	Diff.
Start MS	10.1	1 – 21	1.20	7.4	0 – 34	1.60	NS
End MS	10.3	0 – 26	1.57	4.7	0 – 17	0.94	*P<0.05*

Data analysed by standard Mann-Whitney U test (farms ranked by scores)

Median and range of lameness

	Control Farms (n=21)			Plan Farms (n=24)				
	Median % Lame	Range	*U*	Median % Lame	Range	*U*	*z*	Diff.
Start MS	31	10 – 60	223	31	0 – 56	281	1.278	NS
End MS	33	7 – 54	329	25	0 – 55	175	3.392	*P*<0.002
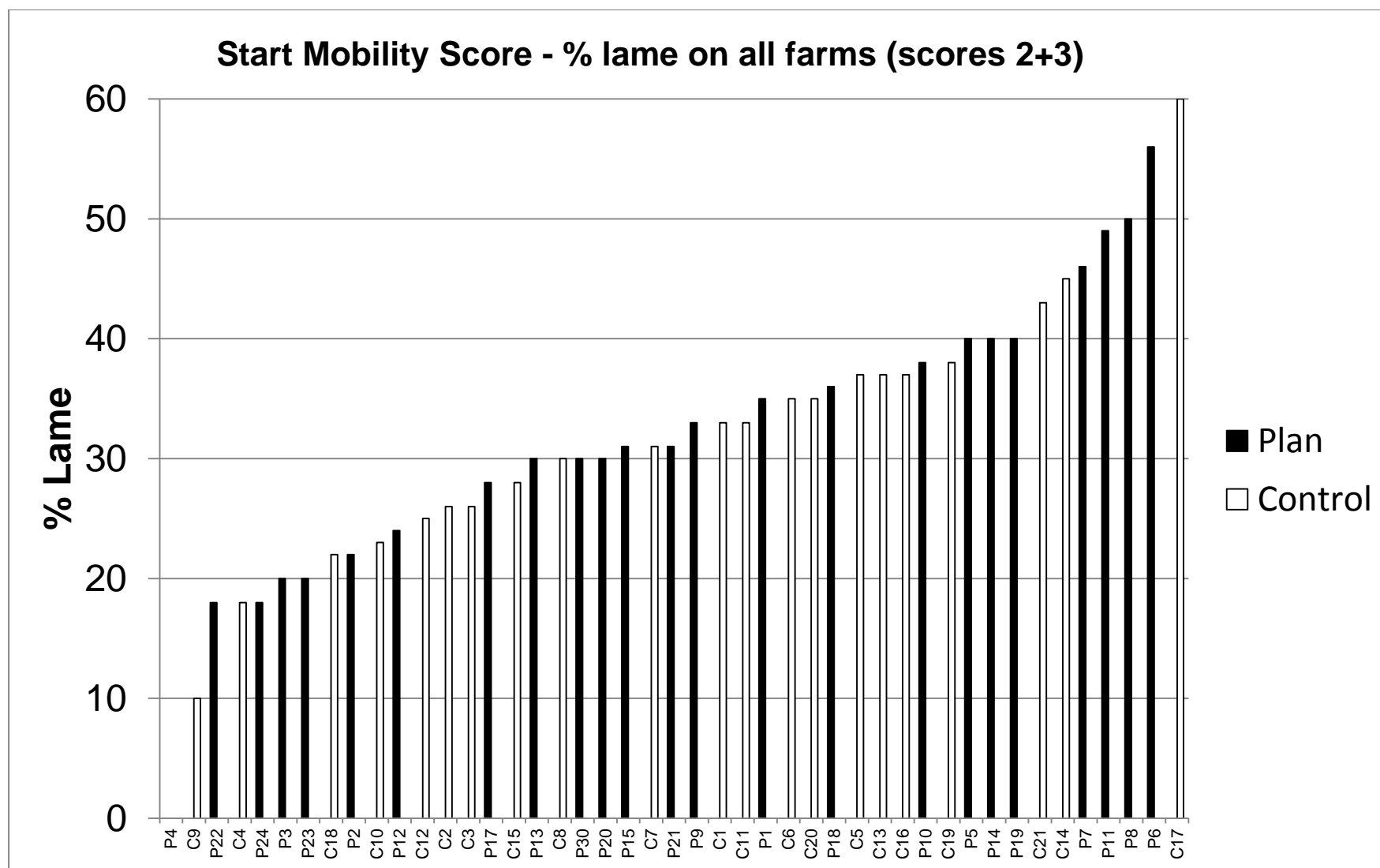
Start Mobility Score - % lame on all farms (scores 2+3)

End Mobility Score - % lame on all farms (scores 2+3)

Legend: ■ Plan ☐ Control

Y-axis: % Lame (0, 10, 20, 30, 40, 50, 60)

X-axis: P4, C15, C9, C8, P6, C19, P24, P2, P22, P6, P12, P16, P13, C14, P3, C4, P15, P23, P9, P17, P11, P14, C2, P19, C5, C18, C3, P18, C1, P1, C6, P21, C10, P7, P10, C12, C7, C13, P20, C21, C11, C20, C17, C16, P8

Data analysed by standard Mann-Whitney U test (farms ranked by scores)

Median and range of lameness

	Control Farms (n=21)			Plan Farms (n=24)				
	Median % 3s	Range	*U*	Median % 3s	Range	*U*	*z*	Diff.
Start MS	10	1 – 21	346	5	0 – 34	158	4.141	*P*<0.001
End MS	9	7 – 54	370	3	0 – 55	134	10.397	*P*<0.001

Start Mobility Score - % score 3

End Mobility Score - % score 3

REASEHEATH
COLLEGE
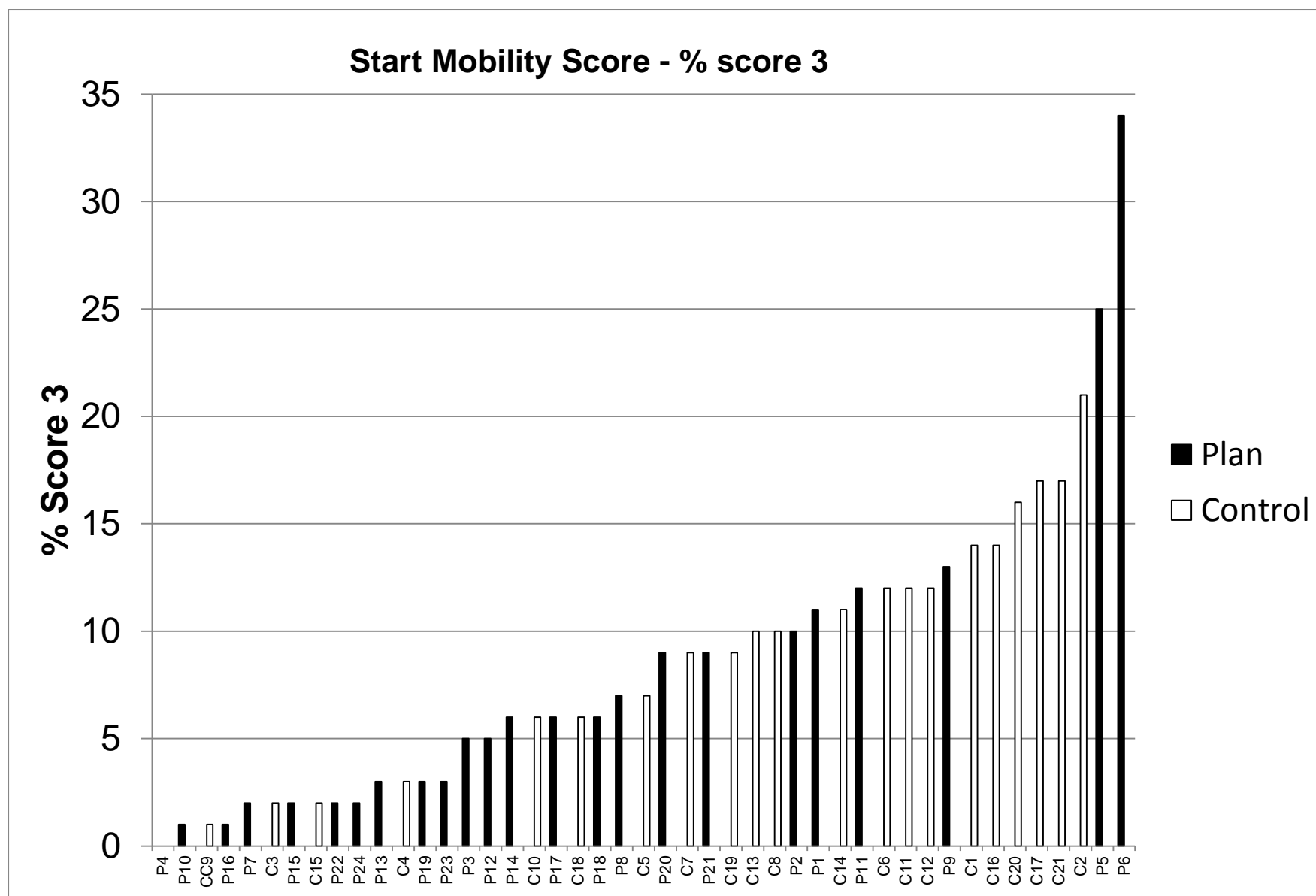
North West Cattle Mobility Project

Plan Farms at START

Farm: Mobility Mentor:
Address:

Names/position: 1:   2:

Date:

Stage of HFP when questionnaire completed:

Reasons for joining HFP and motivations:

(There is opportunity for two people to give their answers to each question)

What prompted you to join the HFP?

What level of lameness do you think you have? (% herd which is lame)

If you have had a herd mobility score done, how does this compare?

Compared with other UK dairy farms, do you think your lameness (% lame) is about average, better, (fewer) or worse (more)

Which types of lameness do you suffer from the most?

Which time of the year do you seem to have more lame cows, if any?

What is it about lameness that motivates you most to want to reduce it?

What cost would you put YOUR herd lameness at? (ppl OR £/year OR £/cow/year)

What do you feel are the most important things affecting lameness in your herd currently?

What previous training or qualifications have you in foot care?

Current understanding:

What are the following conditions called, and briefly, what causes them?:

	name?	
	caused by?	

APPENDIX 6 - PLAN FARMER START QUESTIONNAIRE ANALYSIS

For Steering Team consideration on 23/11/12 – Last updated 18/04/13

1. Profile:

- 24 farms
- 28 questionnaires completed
  - 15 farmers
  - 13 herdspeople

2. Lameness conditions and causes picture quiz

Score out of 14	All answers	Farmers	Herdspeople
Average	10.0	10.5	9.5
Range	1.5 – 13.5	8 – 13.5	1.5 - 13

3. Reasons for joining HFP

Reason	Number giving this answer	% of answers
Wish to improve cattle mobility	15	37.5
Nagging vet / vet recommendation	11	27.5
Wish to improve knowledge	6	15
Wish to improve farm	3	7.5
Want a farm specific plan	2	5
Coincides with mastitis plan	1	2.5
No reason given	2	5

4. Presumed % lameness in the herd

- Average – 25.4%
- Range – 0.3% to 50%
- 2 Didn't know / weren't sure

5. Presumed % lameness in herd compared with actual mobility scores

Initial data analysis for Plan and Control farms shows:

Actual lameness at start of HFP (Plan farms) or routine MS (Control farms)	Plan farms	Plan farms - Willis	Control farms
Average	31.9	33.3	32.0
Range	0 - 56	18 - 56	10 - 60

6. How do you think your herd lameness compares to UK average?

Answer	Number giving this answer	% giving this answers
Better	8	28.5
Average	15	53.5
Worse	3	11
Don't know	2	7

7. Perception of type of lameness in their herd

Answer	Number giving this answer	% of answers
Sole ulcers	19	35.2
Digital dermatitis	14	25.9
White line disease	12	22.2
Bruising	3	5.6
Fouls	2	3.7
Toe necrosis	1	1.9
Heel erosion	1	1.9
Overgrown	1	1.9
Don't know	1	1.9

8. Comparison with types of lameness found on-farm

Data still coming in.

9. Time of year most lameness experienced

Answer	Number giving this answer	% of answers
Winter	10	32.3
All year round / no particular time	8	25.8
Summer	6	19.4
Autumn	3	9.7
Spring	2	6.5
Don't know	2	6.5

10. Motivations to reduce lameness

Answer	Total Number giving this answer	% of answers
Lameness reduces productivity	19	38.7
Relieve suffering / Cow welfare	19	38.7
Lameness is a hassle	4	8.2
Reduce culls	3	7.5
Pride in the herd	2	4.1
Lame cows reduce staff morale	1	2.0
Public perception of dairy farming	1	2.0

> **The primary motivations for farmers and herdspeople are the same (productivity and welfare).**
> **The main secondary motivation for farmers is reducing culls.**
> **The main secondary motivation for herdspeople is the hassle factor.**

Answer	Number of farmers giving this answer	% of farmer's answers (farmers)	Number of herdspeople giving this answer	% of herdspeople's answers (herdspeople)
Lameness reduces productivity	10	37.0	9	39.1
Relieve suffering / Cow welfare	11	40.7	8	34.8
Lameness is a hassle	1	3.7	3	13.0
Reduce culls	3	11.1	0	0
Pride in the herd	2	7.4	1	4.3
Lame cows reduce staff morale	0	0	1	4.3
Public perception of dairy farming	0	0	1	4.3

Words used in the category 'Lameness reduces productivity':

- **'Yield' – used 5 times**
- **'Fertility' – used 5 times**
- **'Production' – used 4 times**
- **'Cost' – used 4 times**
- **'Productivity' – used 3 times**
- **'Profit – used once**
- **'Financial' – used once**

11. Presumed cost of lameness

A wide variety of answers:

- 9 responded 'don't know' or 'unknown' or 'no idea'
- For the whole herd:
    - £10K
    - £15K (2 answers)
    - £20K
    - £30K
    - £100K (2 answers)
    - £20/cow/year across the whole herd
    - £100/cow/year across the whole herd (2 answers)

- o £500/cow/year across the whole herd
- o 50 litres per cow per year across the whole herd
- Per case:
  - o £50 – 70
  - o £250
  - o £1,000
- Per litre:
  - o 1.0 ppl
  - o 3 – 4 ppl
- Others:
  - o £1.2K per year on medicines plus lost yield
  - o 30% lameness means 400 litres lost = £7K per year
  - o £12 – 14K per year in replacement costs

12. Perception of current important influences on lameness on the farm

Answer	Number giving this answer	% of answers
Cow tracks not right	10	19.2
Cubicles not right	7	13.5
Gateways and stones	6	11.5
Footbathing not right	5	9.6
Surfaces (walking/standing) not right	4	7.7
Scrappers not working right	3	5.8
Don't know	3	5.8
Breeding not right	2	3.8
Collecting yard not right	2	3.8
Overcrowding	2	3.8
Cows not treated immediately	2	3.8
Transition period not right	1	1.9
Walking distances	1	1.9
Bad cow flow	1	1.9
Foot trimming not routine	1	1.9
Lack of time and labour	1	1.9
Lack of finances	1	1.9

13. Level of training in foot care

Answer	Number giving this answer	% of answers
Nothing formal / learned from vet/farmers/foot trimmer	11	29.7
Recent formal course	10	27.0
Own experience	7	18.9
Formal course >10 years ago	5	13.5
None	4	10.8

The only difference in answers on the level of training in foot care is that herdspeople tend to emphasise their own experience more than farmers. Note, though, that both sets have had equal numbers quoting recent formal training.

Answer	Number of farmers giving this answer	% of farmer's answers	Number of herdspeople giving this answer	% of herdpeople's answers
Nothing formal / learned from vet/farmers/foot trimmer	6	33.3	5	26.3
Recent formal course	5	27.7	5	26.3
Own experience	1	5.6	6	31.6
Formal course >10 years ago	3	16.7	2	10.5
None	3	16.7	1	5.3

APPENDIX 7 – End of programme interview Questionnaire for Plan and Control Farms

CATTLE MOBILITY RESEARCH PROJECT

INTERVIEW QUESTIONNAIRE

Name of farmer:

Name of interviewer:

Date:

Farm name and signature:

Number of cows:

Yield per cow:

Calving pattern:

SECTION 1 – Your opinions on cattle mobility and the dairy industry

1.1 How important is lameness/ cattle mobility in the British Dairy Industry?   Score 1 to 5 where 1 = Not important and 5 = Very important   *Answer (1 to 5):*
1.2 In what ways (why) is lameness/ cattle mobility important in the industry?   *Answer: (Open question)*
1.3 How do you rate the British Dairy Industry on efforts to tackle issues relating to cattle mobility? Score 1 to 5 where 1 = poor effort and 5 = excellent effort   *Answer (1 to 5):*
1.4 What does the industry do well in tackling mobility issues?   *Answer (open):*
1.5 What could the industry do better to improve cattle mobility?   *Answer (open):*
1.6 In your opinion, what stops the British Dairy Industry from doing more to improve cattle mobility?   *Answer (open):*
1.7 What do you think is the average rate / incidence of lameness on British dairy farms (cows with mobility score 2 and 3)?   *Answer (% incidence / rate of lameness):*

1.8 In your opinion, what should be the target rate / incidence for lameness on British dairy farms?

Answer (% incidence / rate of lameness):

SECTION 2 – Your understanding of cattle mobility

2.1 How do you rate your personal knowledge on cattle mobility on a scale of 1 to 5, where 1 = poor and 5 = excellent, for:

 - recognising different lesions/ conditions
Answer (1 to 5):

 - understanding the causes of lesions/conditions
Answer (1 to 5):

- knowing how to prevent lameness
Answer (1 to 5):

2.2 Thinking of you and those that work/interact with you on your farm, how do you rate the level of knowledge of cattle mobility 'on the farm', where 1 = poor and 5 = excellent?

Answer (1 to 5):

2.3 Again, thinking of your farm, who works/interacts with you to improve cattle mobility?

Answer (tick):
You
Owner
Herdsman
External foot trimmer
Farm consultant
Vet
Nutritionist
Staff
Others (please specify):

2.4 Do you routinely lift and look at cow's feet?

Answer: Yes/No

If yes, how often do you lift and look at cow's feet?

Answer (open):

2.5 What is your foot trimming routine?

Answer (open):

2.6 Who does the routine foot trimming in your herd and what foot care qualifications does this person have?

Answer (open):

2.7 Who does the lame cow foot trimming in your herd and what foot care qualifications does this person have?

Answer (open):

2.8 Thinking of the last 12 months, have you sought out information on cattle mobility/lameness? *Answer: Yes/No* **For Control Farms only**
2.9 Where do you get information and advice on cattle mobility? *Answer (tick):* *Farm consultant* *Journals and press/media* *Web* *Specific publications on mobility/lameness* *Vet* *Foot trimmer* *Discussion Group* *Neighbours* *DairyCo* *Own college/university education* *Training courses* *Family* *Other (please state):*
2.10 On a scale of 1 to 5, please score how credible you feel different sources of information and advice on cattle mobility are (where 1 = not credible at all and 5 = totally credible). *Answer (1 to 5 for each):* *Farm consultant* *Journals and press/media* *Web* *Specific publications on mobility/lameness* *Vet* *Foot trimmer* *Discussion Group* *Neighbours* *DairyCo* *Own college/university education* *Training courses* *Family* *Other (please state):*

2.11 What are the following conditions called, and briefly, what causes them?: **If you have had the DHFP on your farm, you will have answered this question already, but please do so again so that we can track changes in your understanding.**

	Name?	
	Caused by?	

	Name?	
	Caused by?	
	Name?	
	Caused by?	
	Name?	
	Caused by?	
	Name?	
	Caused by?	
	Name?	
	Caused by?	

| | Name? | |
| | Caused by? | |

2.12 What % lameness do you think you have on your farm (in the last 12 months)?
Answer (% level / rate / incidence):

2.13 Compared with other British dairy farms, do you think your % lameness is about average, better, (fewer) or worse (more)?
Answer (average, better, worse):

2.14 What cost would you put YOUR herd lameness at?
Answer (ppl OR £/year OR £/cow/year):

2.15 Please rank the top five factors in terms of cost from the following list (where 5 = most costly factor and 1 = least costly factor:
Answer (1 – 5 ranking): *Treatment* *Time and labour (for treatment and extending milking time)* *Infertility* *Culls* *Milk loss* *Foot trimming* *Loss of cow condition* *Foot bathing* *Others (please state):*

2.16 What do you feel are the most important things affecting mobility in your herd?
Answer (open):

2.17 Thinking about your farm and animals, what things do you feel contribute to controlling/reducing mobility problems in your herd?
Answer (open):

2.18 What training or qualifications do you have /have undertaken in foot care? (If you are not named in answers to questions 2.6 or 2.7
Answer (open): **For Control Farms only**

2.19 In the past 12 months, what measures have you undertaken to improve cattle mobility on your farm?
Answer (tick from list):

cubicle design or modifications
improved lying surfaces/ bedding comfort
rubber matting on areas of flooring
concrete repairs and/ or grooving
building/ parlour design
Changes to nutrition/ feeding
Improved walkways/ tracks
Breeding programme
foot bathing - started to do
foot bathing - better procedure
Foot trimming - started using an external trimmer
Foot trimming - better use of external trimmer
Foot trimming - better equipment and/or crush
Foot trimming - received training (self or other farm team member)
Improved slurry management
Altered human/stockman training/behaviour
Mobility scoring – started to do
Mobility scoring - improved procedure and/ or frequency
Introduced a lame cow recovery group/ area
Lameness/ mobility improvement plan
Other...

2.20 If you are going to make changes to improve cattle mobility in the near future, in what areas will these be?

Answer (tick from list):

No changes planned
cubicle design or modifications
improved lying surfaces/ bedding comfort
rubber matting on areas of flooring
concrete repairs and/ or grooving
building/ parlour design
Changes to nutrition/ feeding
Improved walkways/ tracks
Breeding programme
foot bathing - started to do
foot bathing - better procedure
Foot trimming - started using an external trimmer
Foot trimming - better use of external trimmer
Foot trimmimg - better equipment and/or crush
Foot trimming - received training (self or other farm team member)
Improved slurry management
Altered human/stockman training/behaviour
Mobility scoring – started to do
Mobility scoring - improved procedure and/ or frequency
Introduced a lame cow recovery group/ area
Lameness/ mobility improvement plan
Other…

2.21 On a scale of 1 to 5, where 1 = not important and 5 = extremely important, how would you score the following issues in relation to how important they are for improving cattle mobility? (Please score each issue from 1 to 5 – DO NOT rank them).

Answer (1 to 5 for each element):

cubicle design or modifications
improved lying surfaces/ bedding comfort
rubber matting on areas of flooring

concrete repairs and/ or grooving *building/ parlour design* *Changes to nutrition/ feeding* *Improved walkways/ tracks* *Breeding programme* *foot bathing* *Foot trimming* *Improved slurry management* *Altered human/stockman training/behaviour* *Mobility scoring* *Introduced a lame cow recovery group/ area* *Lameness/ mobility improvement plan* *Other (if mentioned above in 2.15 or 2.17)…*

SECTION 3 – Motivations

3.1 Thinking about your dairy enterprise, please describe your key business objectives? *Answer (open):*
3.2 Please score from 1 to 5 the following statements as they apply to you (where 1 = does not apply to me at all, and 5 = applies to me completely). *Answer (score):* *I am in dairy farming for the lifestyle.* *I am in dairy farming to make a profit.* *I believe in having clear business objectives for my dairy farm enterprise.* *I have clear personal objectives for my dairy farm enterprise.* *The main problem with my business is lack of management time.* *Applying new techniques and knowledge is the main route to achieving success in my dairy enterprise.* *The people that work with me / as part of an extended team are important in the success of my farming business.*
3.3 Please score the following aspects of animal health in your farm management (where 1 = not important, and 5 = extremely important). *Answer (1 to 5 for each aspect):* *Controlling mastitis* *Breeding policy* *Controlling Mobility/lameness* *Biosecurity* *Animal nutrition and feeding* *Infectious diseases (other than TB)* *Fertility* *Poor rumen health* *Calf health* *Bovine TB* *Animal health planning* *Calving ease/difficulty* *Transition management*
3.4 The following is a list of negative outcomes from lameness. Please score these from 1 to 5 (where 1 = not important, and 5 = extremely important). *Answer (1 to 5 for each negative outcome):* *Poor cow condition* *Unable to walk to grazing*

Extra time working
Reduced profits
Reduced fertility
Farm assurance failure
Pain and suffering for the cow
Reduced milk yield
Reduced morale
Reduced yield of milk solids
Poor public image of dairy farming
Treatment cost

3.5 Please score the following factors in motivating you to take action in improving cattle mobility on your farm (where 1 = doesn't motivate me at all, and 5 = a very important motivating factor).

Answer (1 to 5 for each motivating factor):
Feeling sorry for lame cows
The image of dairy farming
Lame cows cost money
I dislike having to deal with/treat lame cows
What others might think about me as a farmer
Pride in a healthy herd
Relationship with milk buyer
Feeling guilty about lame cows
Farm assurance

3.6 If you were assured that reducing lameness on your farm by 50% could save you £11,000 per 100 cows, would this provide extra motivation for you to take more action on improving cattle mobility (please score 1 to 5, where 1 = would not provide extra no motivation, and 5 = would provide the prime motivation)?

Answer (score 1 to 5):

3.7 How useful would a benchmarking exercise be in motivating you to take action on cattle mobility, in which you could compare the mobility scores from your herd with the national average, bottom 10% and top 10%? Please answer 1 to 5, where 1 = benchmarking would not motivate me at all, and 5 = benchmarking would become my prime motivation in taking action to control mobility.

Answer (score 1 to 5):

3.8 How useful would benchmarking within your herd be in motivating you to take action on cattle mobility, in which you could compare the mobility scores from your herd over time against a target? Please answer 1 to 5, where 1 = benchmarking within my herd would not motivate me at all, and 5 = benchmarking within my herd would become my prime motivation in taking action to control mobility.

Answer (score 1 to 5):

3.9 If your milk buyer were to offer a financial incentive to maintain low levels of lameness on your farm, such as an increased milk price for less than 10% lame cows and a milk price penalty for more than 30% lame cows, how much would this motivate you to take action? Please score each of the following between 1 = no extra motivation and 5 = would be a prime motivator.

Answer (score 1 to 5):

SECTION 4 – Barriers

4.1 Thinking about the circumstances and situation of your own farm, what would you say are the main barriers that restrict you taking action to improve cattle mobility?

Answer (open):

4.2 Score the following reasons as restrictions on taking action to improve cattle mobility from 1 to 5 (where 1 = not a barrier, and 5 = a major barrier).

Answer (score 1 to 5 for each reason):
Breed of cow
Cost of improvements
Time to make changes
Staff motivation
Lack of information
Lack of training
Not knowing which improvements to make to gain a significant difference
Design of parlour and access/egress
Design of housing and cubicles
State of concrete and standing areas
Walk ways and tracks
Other (please state):

4.3 Thinking about you personally, what would you say are the main barriers that hold you back from taking action to improve cattle mobility?

Answer (open):

4.4 Score the following reasons that might hold you back personally from taking action to improve cattle mobility from 1 to 5 (where 1 = not a barrier, and 5 = a major barrier).

Answer (score 1 to 5 for each reason):
Lack of motivation
Lack of time
I'm not sure which actions I can take which will make a difference
Taking action on mobility is not a high priority
Taking action on mobility would not provide an economic return
Cattle mobility does not interest me
Other (please state):

SECTION 5 – The DairyCo Healthy Feet Programme

5.1 Thinking about your experience of the DHFP, please score the following aspects from 1 to 5 (where 1 = not useful, to 5 = extremely useful)

Answer (score 1 to 5 for each aspect):
Taking time-out to focus on cattle mobility
The structure of the DHFP
Helping my farm work as a team
The input of my Mobility Mentor/Vet
The Mobility Contract
The prioritised action plan
The mobility scoring
A better understanding of cattle mobility/ causes of lameness
Any other mentioned…

For Plan Farms only

5.2 What suggestions do you have to improve the DHFP?

Answer (open):

For Plan Farms only
5.3 How likely are you to recommend the DHFP to other farmers? Please provide a score from 1 to 5 (where 1 = I would not recommend the DHFP to anyone, to 5 = I would very highly recommend the DHFP to other farmers). *Answer (score 1 to 5):*
For Plan Farms only
5.4 How likely are you to continue with the DHFP? Please provide a score from 1 to 5 (where 1 = I will not continue with the DHFP, to 5 = I will definitely continue with the DHFP). *Answer (score 1 to 5):*
For Plan Farms only
5.5 If you are definitely, or are considering, not continuing with the DHFP, please give you reason(s). Answer (open):
For Plan Farms only
5.6 How do you rate the DHFP as 'value for money'? Please score from 1 to 5 (where 1 = poor value for money, and 5 = excellent value for money). *Answer (score 1 to 5):*
For Plan Farms only
5.7 Has your attitude to mobility/lameness changed as a result of the DHFP? *Answer: Yes/No* If Yes, how has your attitude changed? *Answer: (open):*
For Plan Farms only
5.8 Have you heard of the DairyCo Healthy Feet Plan? *Answer: Yes/No* *If yes, what do you understand the DHFP to be?* *Answer:*
For Control Farms only
5.9 Are you aware of the any other lameness control Plan? *Answer: Yes/No* *If yes, what are they?:*
For Control Farms only

APPENDIX 8 – End interview questionnaire results
## END QUESTIONNAIRE RESULTS

Farm details

	PLAN FARMS	CONTROL FARMS
Cow numbers (average)	295	240
Cow numbers (range)	72 to 550	90 to 540
Yield (litres per cow average)	8,863	7,917
Yield (litres per cow range)	5,000 to 11,000	6,500 to 9,400
Number of AYR systems	22	17
Number of block calving systems	1	4
Total number farms questioned	23	21
Number of questionnaires completed	27	20

SECTION 1 – Your opinions on cattle mobility and the dairy industry

1.1   How important is lameness/ cattle mobility in the British Dairy Industry? (Score 1 to 5 where 1 = Not important and 5 = Very important)

- PLAN FARMS   4.59
- CONTROL FARMS   4.80

1.2   In what ways (why) is lameness/ cattle mobility important in the industry? (Answer - open)
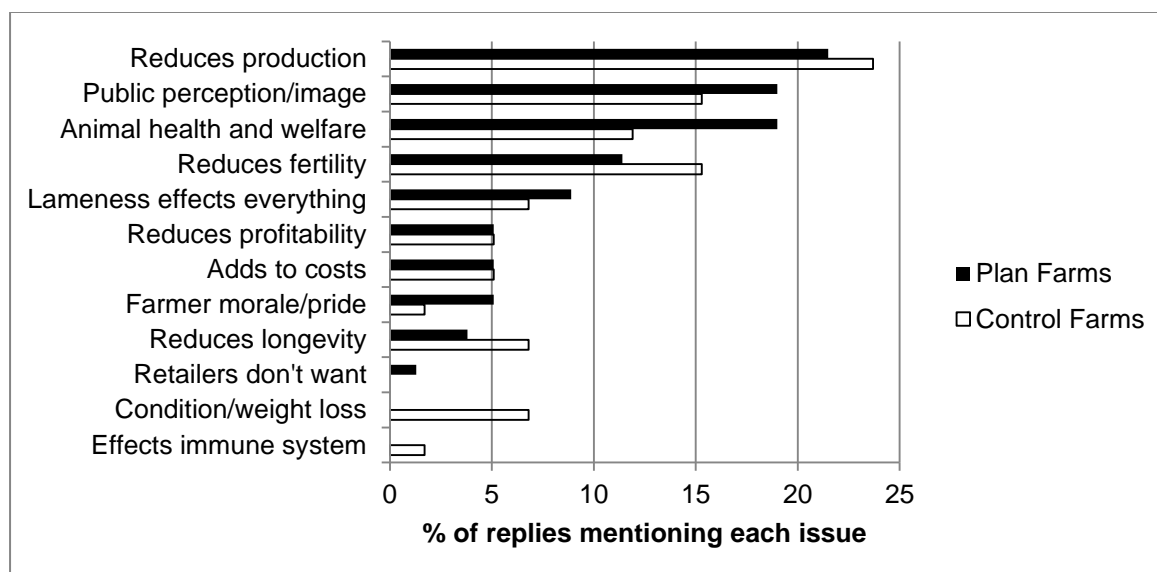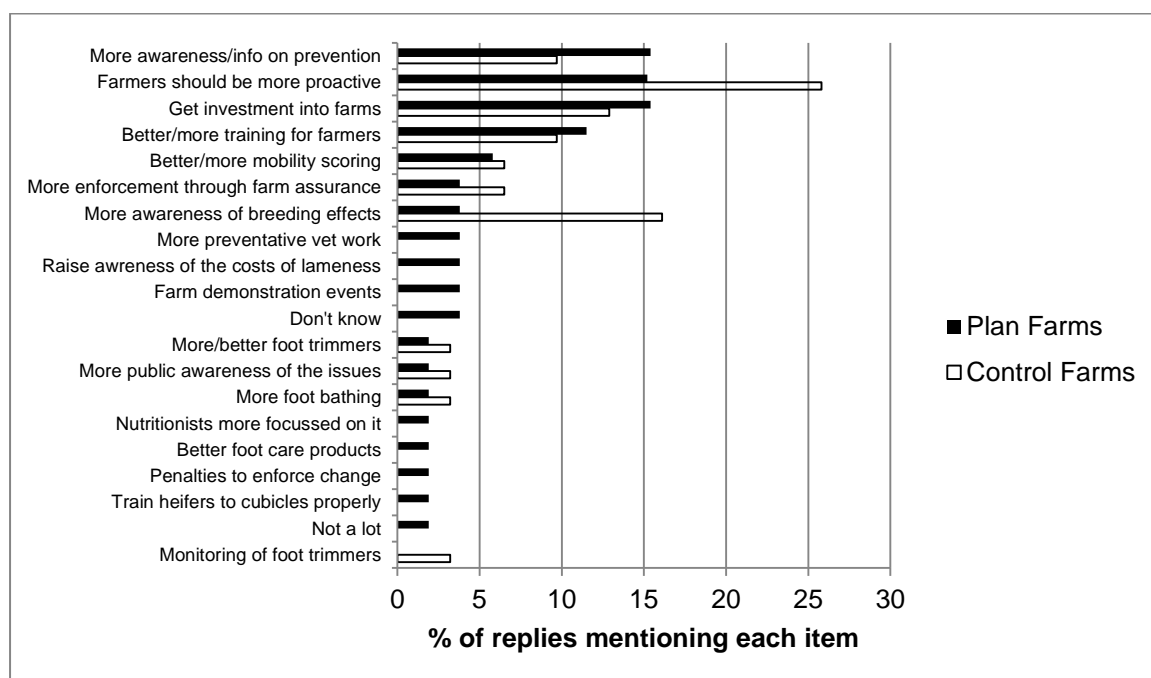

1.3   How do you rate the British Dairy Industry on efforts to tackle issues relating to cattle mobility? (Score 1 to 5 where 1 = poor effort and 5 = excellent effort)

- PLAN FARMS   3.37
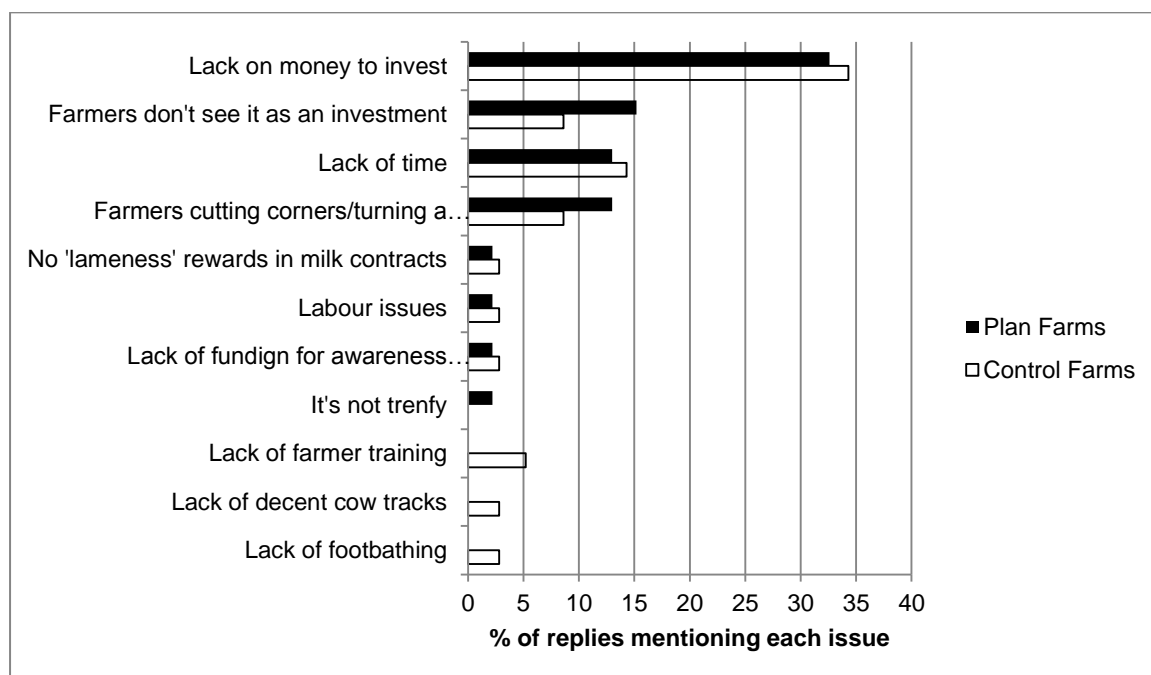- CONTROL FARMS   3.25

1.4   What does the industry do well in tackling mobility issues? (Answer - open):
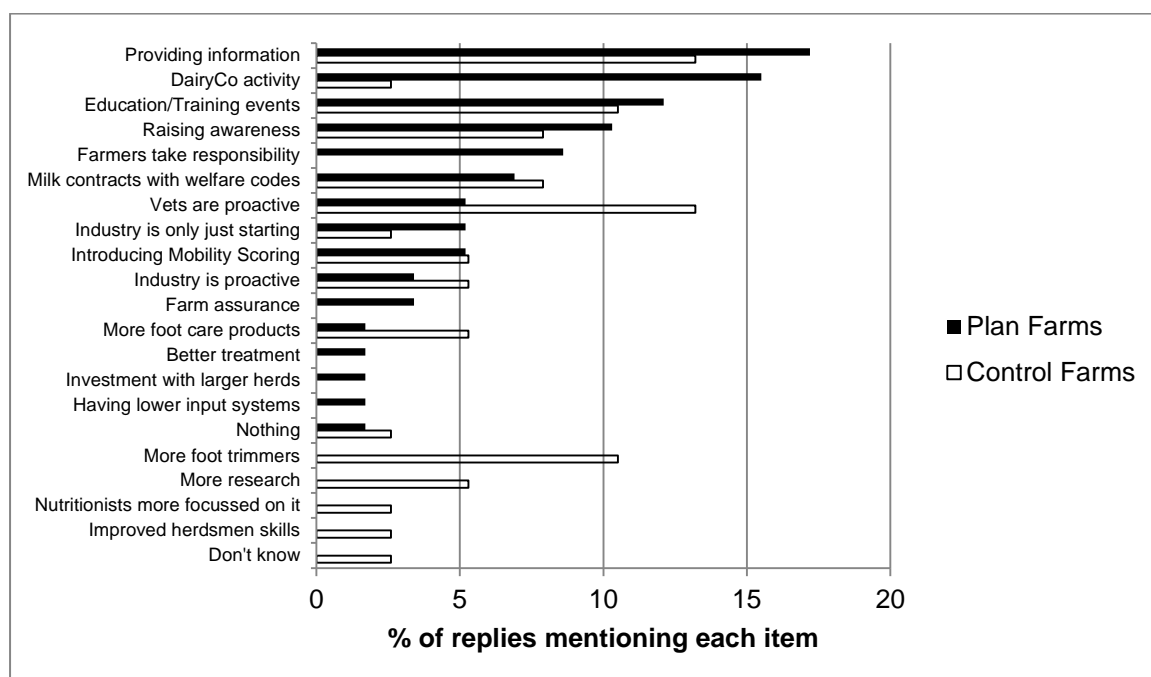
1.5   What could the industry do better to improve cattle mobility? (Answer - open):

1.6   In your opinion, what stops the British Dairy Industry from doing more to improve cattle mobility? (Answer - open):

1.8   What do you think is the average rate / incidence of lameness on British dairy farms (cows with mobility score 2 and 3)? (Answer - % incidence / rate of lameness):
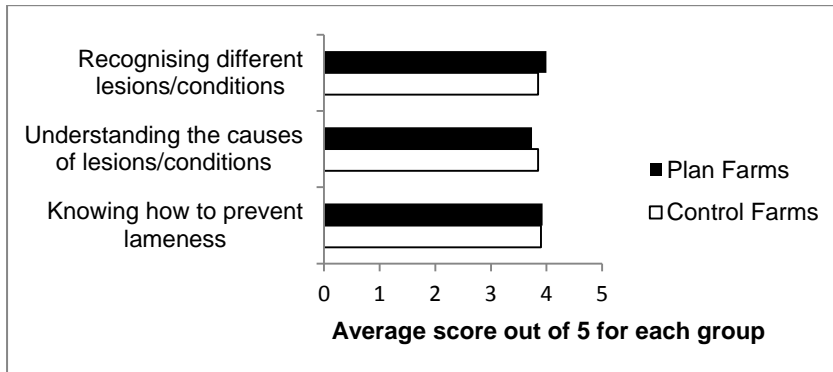
	PLAN FARMS	CONTROL FARMS
Average	35.7	24.0
Range	16 to 70	2 to 50

1.9   In your opinion, what should be the target rate / incidence for lameness on British dairy farms? (Answer - % incidence / rate of lameness):
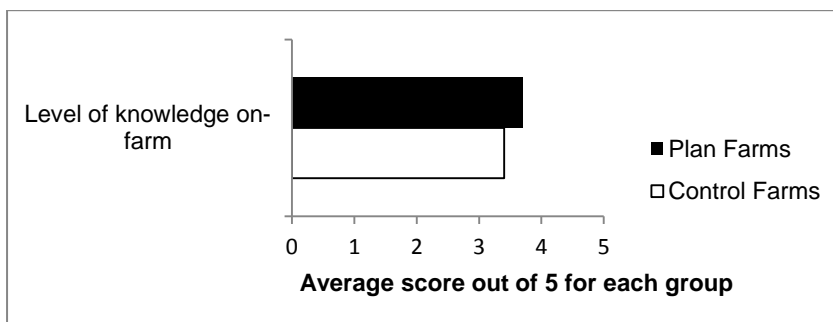
	PLAN FARMS	CONTROL FARMS
Average	12	8.4
Range	0 to 20	0 to 25

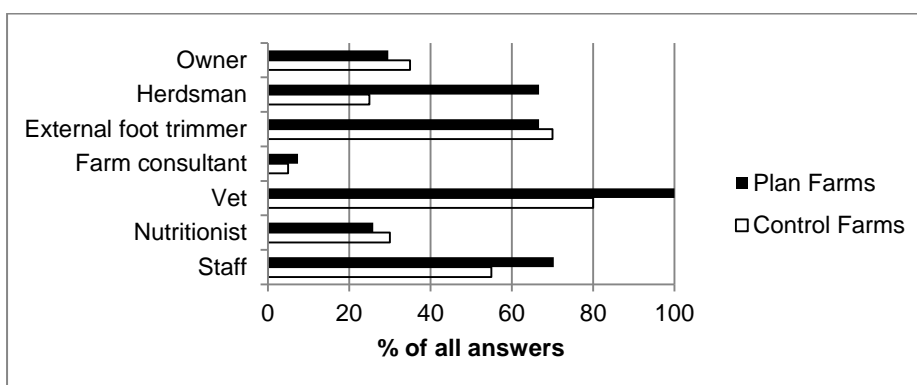## SECTION 2 – Your understanding of cattle mobility

2.1 How do you rate your personal knowledge on cattle mobility on a scale of 1 to 5, where 1 = poor and 5 = excellent, for: - recognising different lesions/ conditions - understanding the causes of lesions/conditions - knowing how to prevent lameness

2.2 Thinking of you and those that work/interact with you on your farm, how do you rate the level of knowledge of cattle mobility 'on the farm', where 1 = poor and 5 = excellent? (Answer - 1 to 5):

2.3 Thinking of your farm, who works/interacts with you to improve cattle mobility?
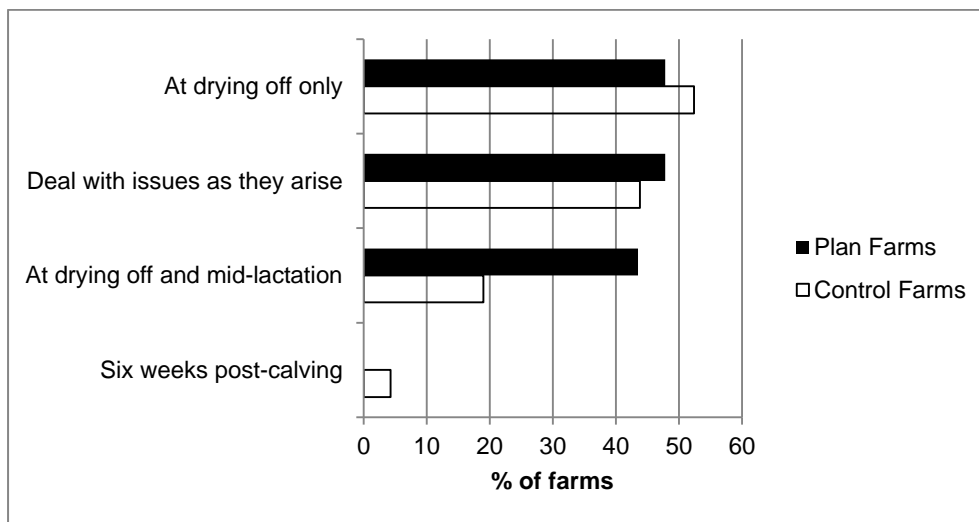
Note: We do not think that the interviewees fully understood this question, so it should be omitted.

2.5 What is your foot trimming routine? (Answer - open):

2.6 Does a foot trimmer input to your routine trimming? (Answer - open):
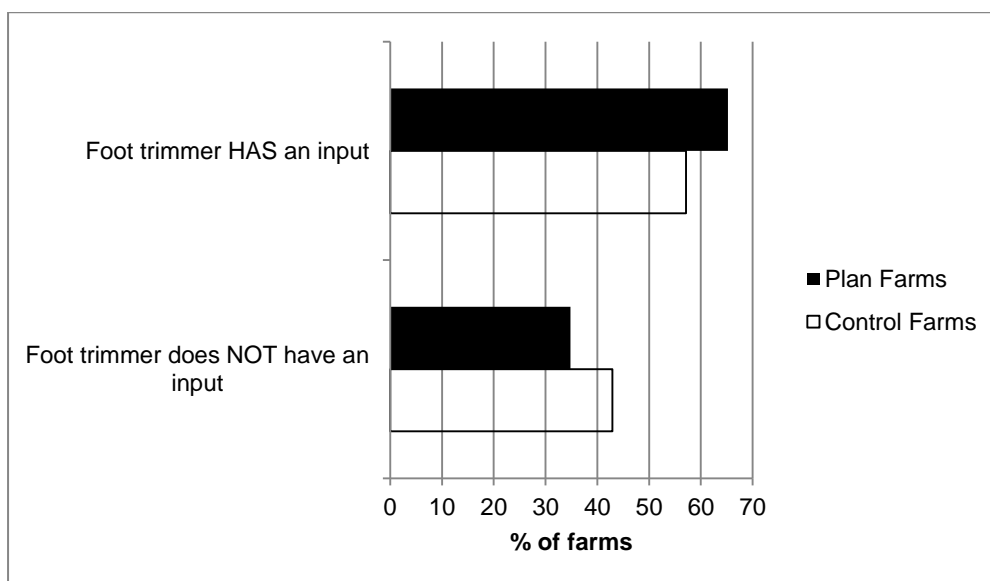
2.7 Does a vet and/or foot trimmer input to your lame cow trimming? (Answer - open):
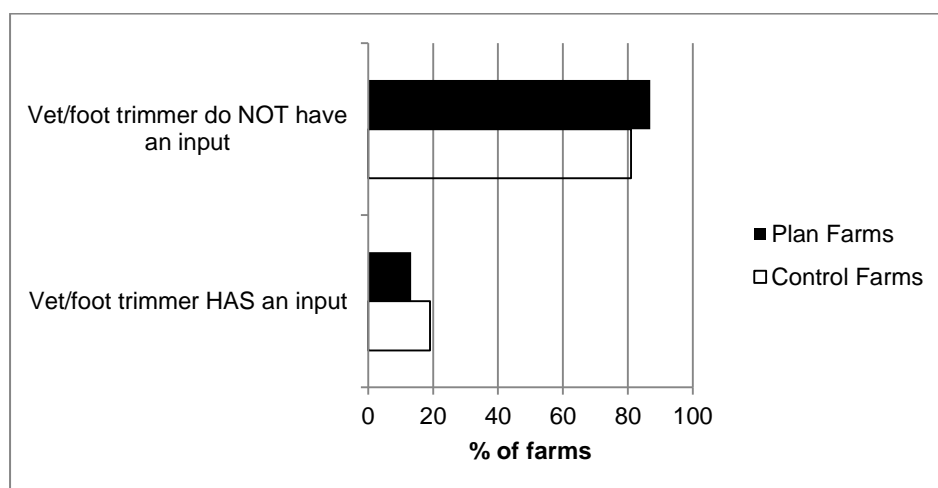
2.8 Levels of training in farmers, herdsmen and staff who are involved in lameness on farm

Level of training	% of people	
	PLAN FARMS	CONTROL FARMS
Nothing formal / learned from vet/farmers/foot trimmer	29.7	9.1
Recent formal course	27.0	31.8
Own experience	18.9	4.5
Formal course >10 years ago	13.5	9.1
None	10.8	45.5

2.9 Thinking of the last 12 months, have you sought out information on cattle mobility/lameness? (Answer: Yes/No) - *For Control Farms only*

45% of those interviewed from Control Farms had sought out information on lameness in the last 12 months.

2.10 Where do you get information and advice on cattle mobility?
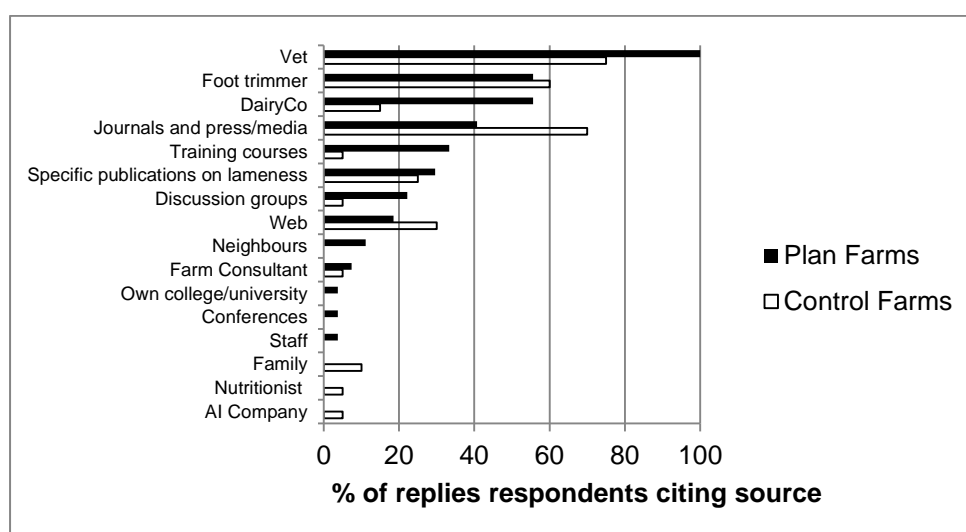
2.11 On a scale of 1 to 5, please score how credible you feel different sources of information and advice on cattle mobility (that you have used) are (where 1 = not credible at all and 5 = totally credible).
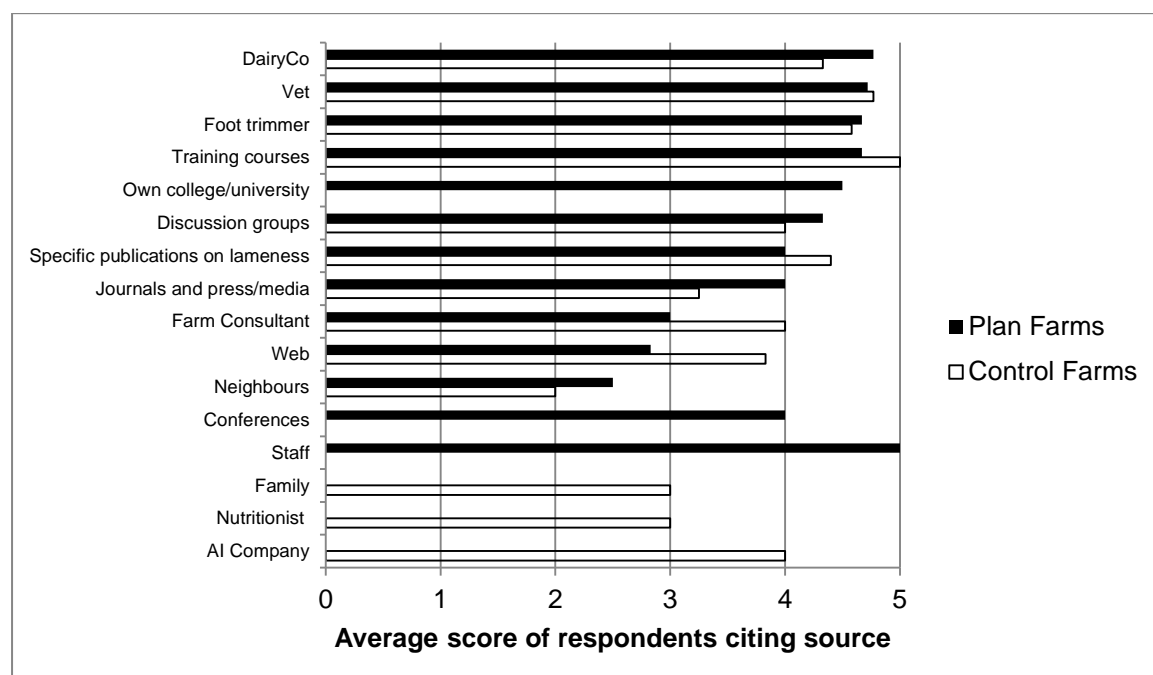
2.12   Lameness conditions and causes picture quiz

Score out of 14	Plan farms at start*	Plan farms at end	Control farms at end	Sig. diff.
Average	10.0	10.4	7.4	P<0.01
Range	1.5 – 13.5	4.5 – 14.0	2.0 – 12.0	
+SEM	0.49	0.42	0.62	

*All Plan Farms had their first vet DHFP visit before the start questionnaire was completed and so would have had some input into lesion recognition from the vet at that stage.

2.13 What % lameness do you think you have on your farm (in the last 12 months)? (Answer - % level / rate / incidence):

Plan Farms – Actual vs Presumed lame (scores 2+3) at start of HFP

Plan Farms – Actual vs Presumed lame (scores 2+3) at end of HFP

Control Farms – Actual vs Presumed lame (scores 2+3) at end of project
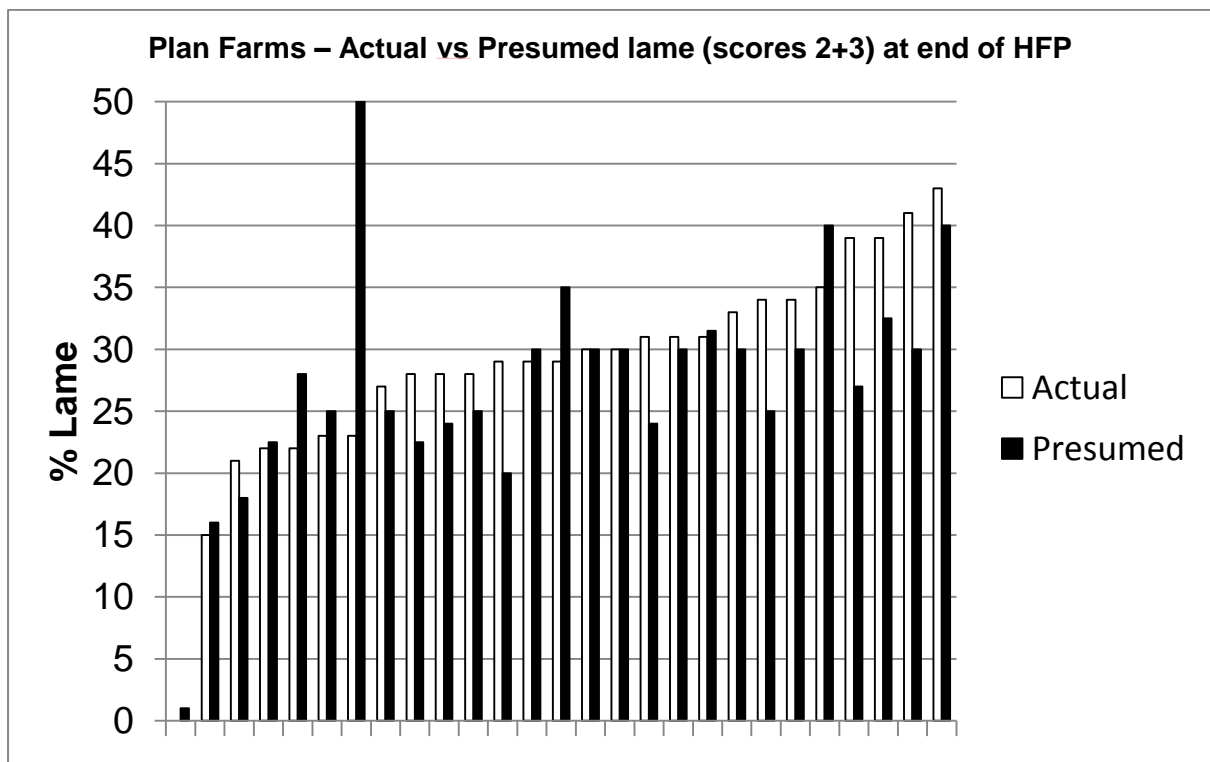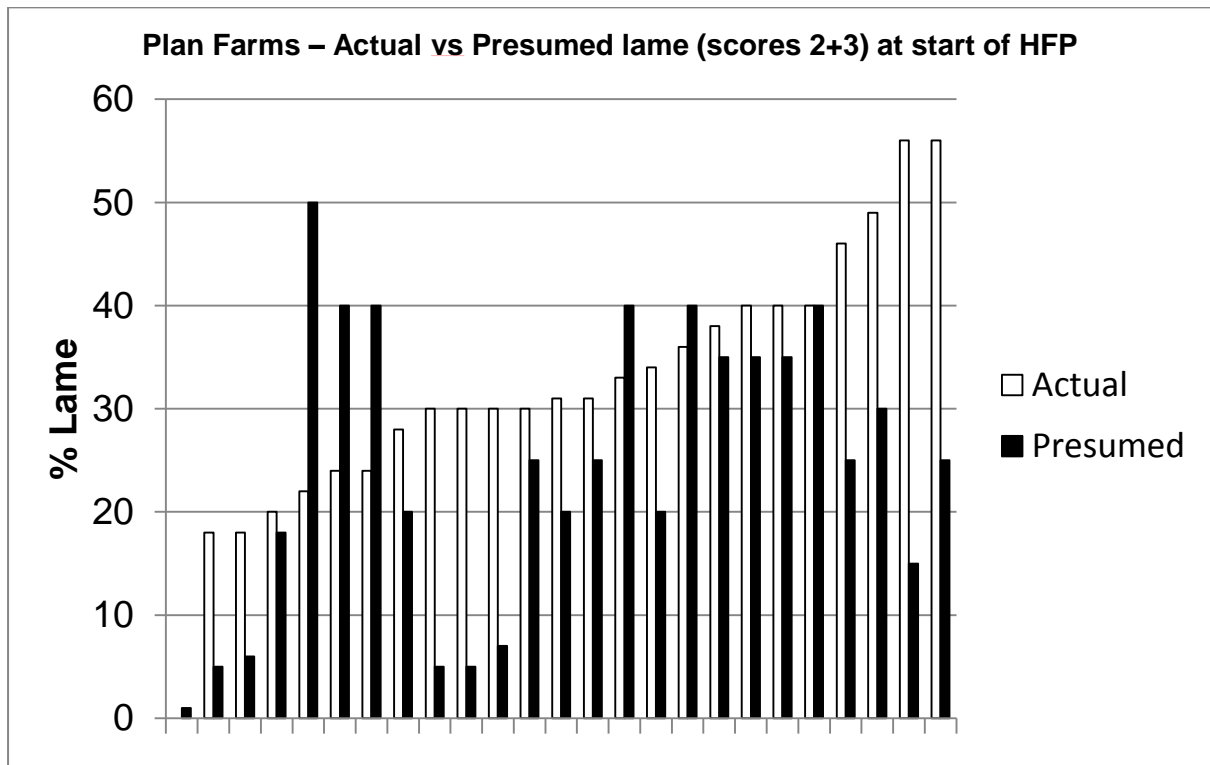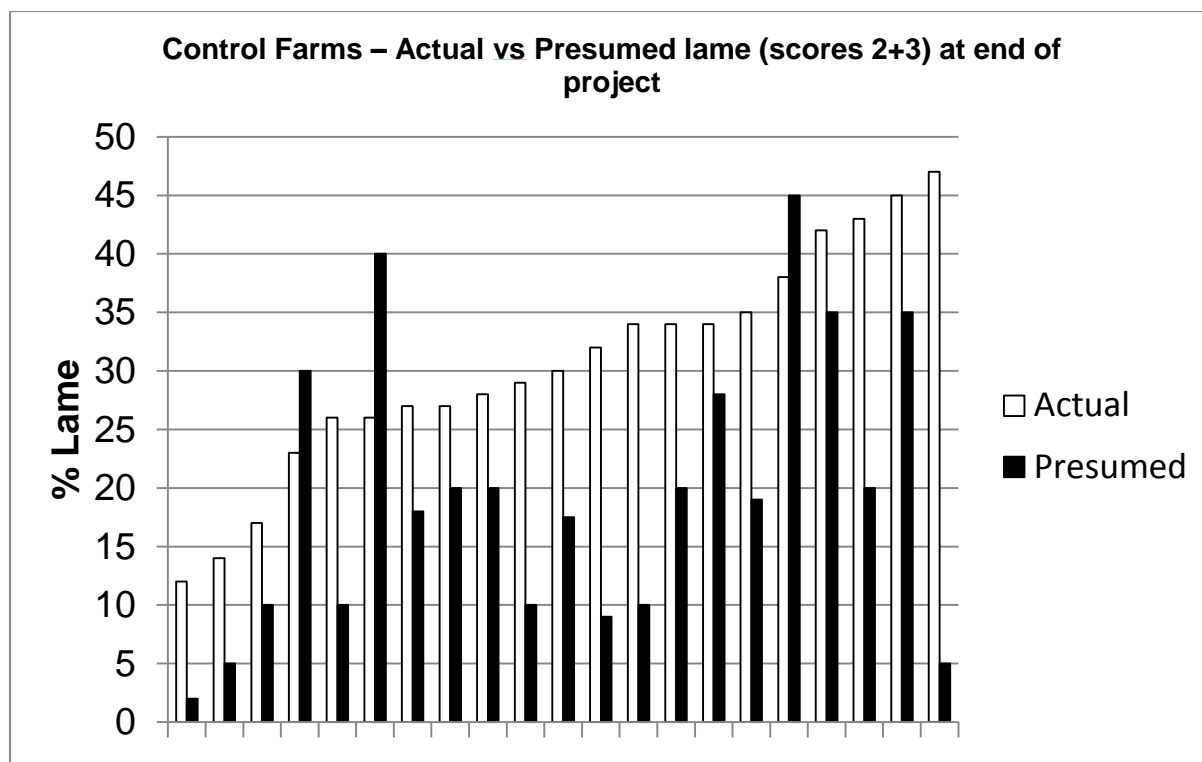
Actual vs Presumed % Lame stats

Group/Time	% answering 'don't know'	Actual	± SEM	Presumed	± SEM	Sig. diff.
Plan farms – start HFP	**7.1**	**32.2**	2.49	**24.3**	2.81	*P*<0.05
Plan farms – end HFP*	**3.6**	**28.7**	1.64	**27.5**	1.71	NS
Control farms – end project*	**0**	**30.6**	2.08	**19.5**	2.65	P<0.001

*Note: these interviewees were asked what their presumed % lameness was over the last 12 months and the answers were compared with the actual average % lameness over that same time period – these are not the end of DHP scores.

2.14 Compared with other British dairy farms, do you think your % lameness is about average, better, (fewer) or worse (more)? (Answer - average, better, worse):

Answer	% giving this answers		
	Plan Farms at start	Plan farms at end	Control farms at end
Better	28.5	40.8	25
Average	53.5	48.1	45
Worse	11	3.7	25
Don't know	7	7.4	5

2.15 What cost would you put YOUR herd lameness at? (Answer - ppl OR £/year OR £/cow/year):

Plan Farms – Calculated vs presumed cost of lameness at start of HFP

£/cow/year

☐ Calculated
■ Presumed

Plan Farms – Calculated vs presumed cost of lameness at end of HFP

£/cow/year

☐ Calculated
■ Presumed

Control Farms – Calculated vs presumed cost of lameness at end of project
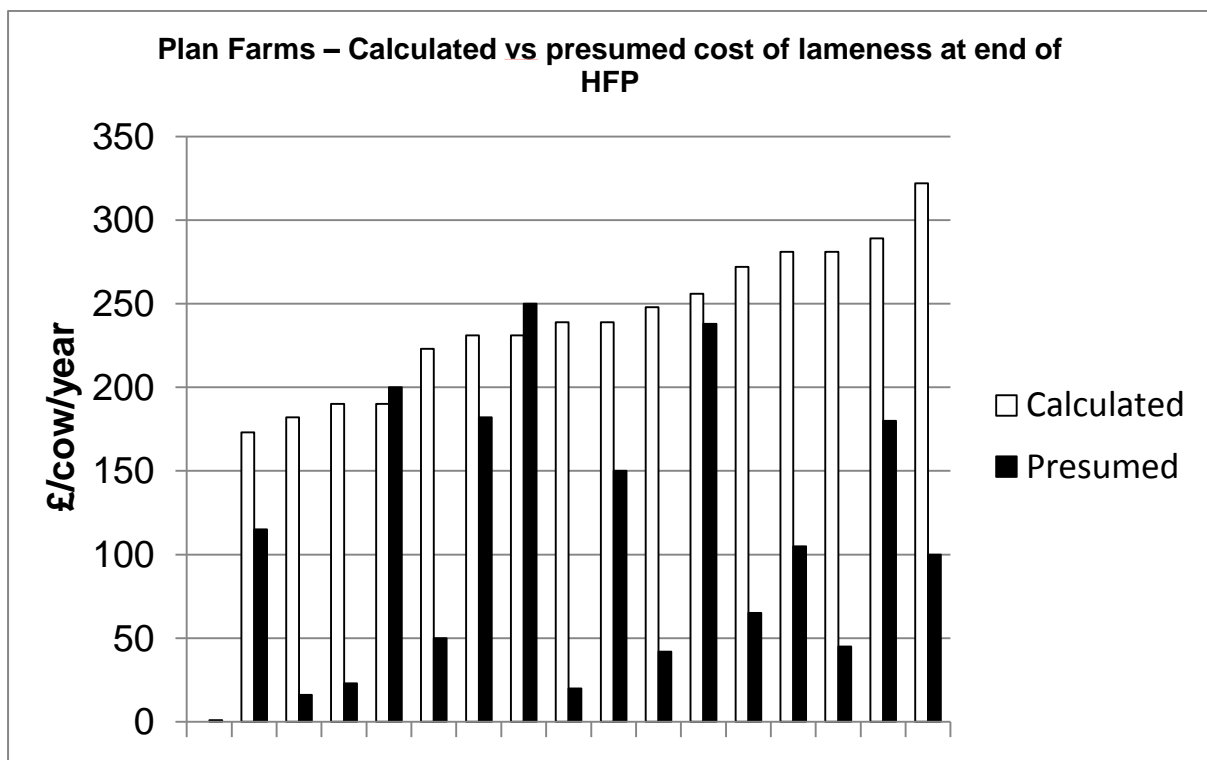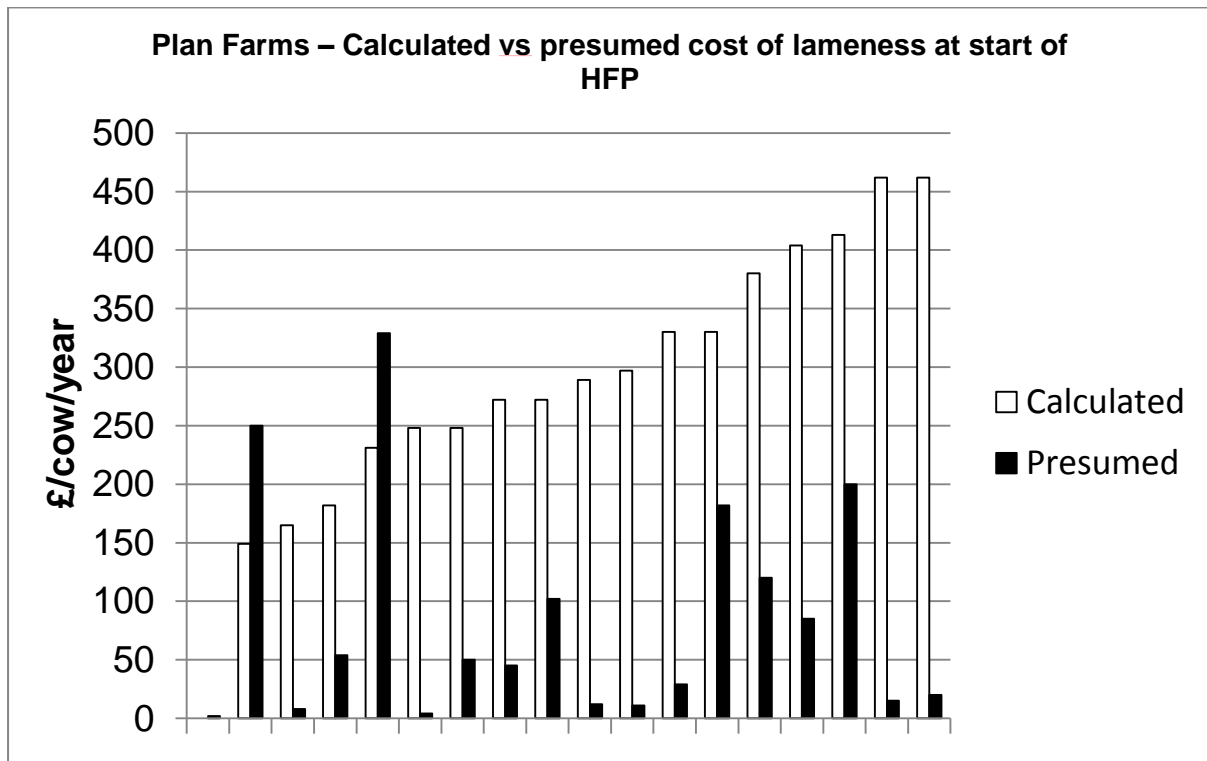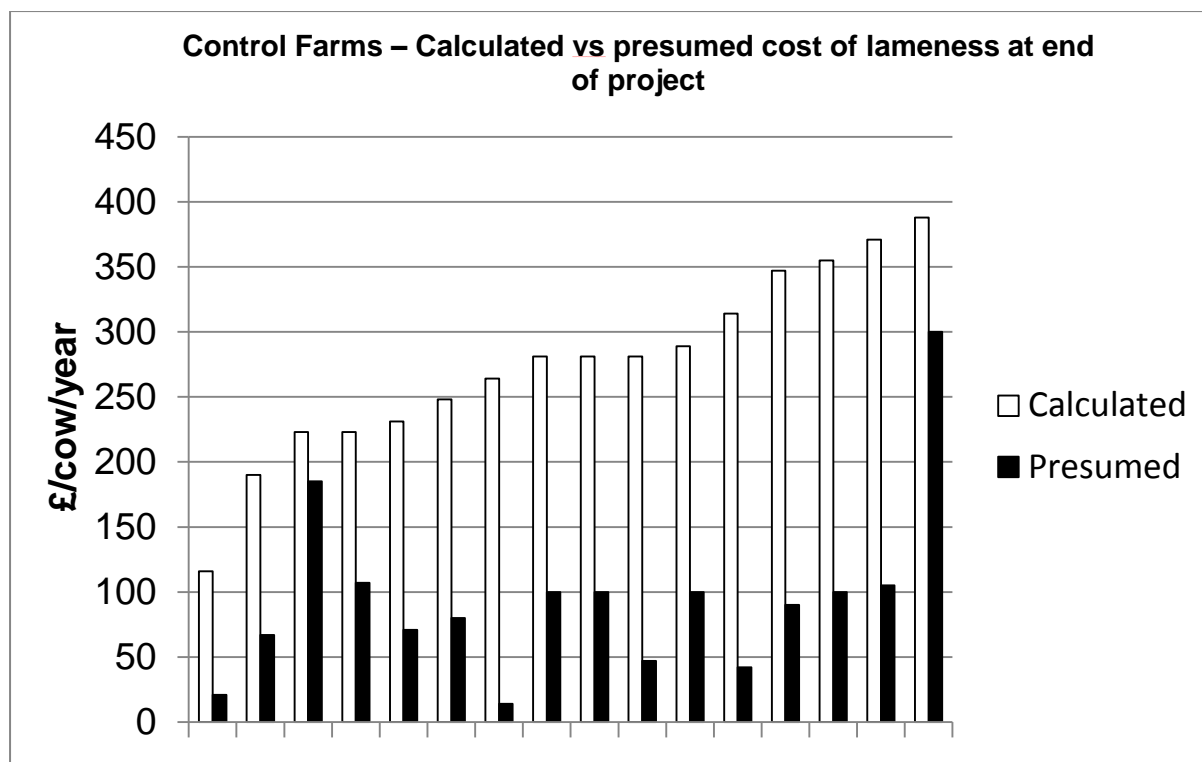
Calculated vs Presumed cost of lameness stats (£/cow/yr)

Group/Time	% answering 'don't know'	For respondents that answered				
		Calculated	± SEM	Presumed	± SEM	Sig. diff.
Plan farms – start HFP	24.0	285	27.9	84	22.7	NS
Plan farms – end HFP	24.0	226	17.3	105	19.8	NS
Control farms – end project	28.5	275	17.8	96	17.0	NS

Calculated cost of lameness stats (£/cow/yr) for all farms

Group/Time	Calculated cost	Range	± SEM
Plan farms – start HFP	263	0 – 413	20.9
Plan farms – end HFP*	230	0 – 355	14.0
Control farms – end project*	254	99 – 388	16.4

Note: For an average Plan Farm of 295 cows, a reduction of £33 per cow in the cost of lameness equates to a £9,735 improvement in the business, which is a £6.5:1 return on a DHFP cost of £1,500 (this does not include the costs of interventions).

2.16 Please rank the top five factors in terms of cost from the following list (where 5 = most costly factor and 1 = least costly factor: (*Answer - 1 – 5 ranking):*

Factor	Plan Farms		Control Farms	
	Ave. ranking	% respondents picking factor	Ave. ranking	% respondents picking factor
Infertility	3.8	93	3.9	85
Milk loss	3.7	100	3.6	100
Culls	3.5	89	3.7	90
Treatment	2.2	70	2.2	65
Time and labour	2.1	78	2.4	55
Loss of cow condition	2.0	52	2.2	60
Foot trimming	1.7	44	1.8	40
Footbathing	1.0	7	1.3	15

2.17 What do you feel are the most important things affecting mobility in your herd? (*Answer - open):*

2.18 Thinking about your farm and animals, what things do you feel contribute to controlling/reducing mobility problems in your herd? (*Answer - open):*

The chart's y-axis (top to bottom): Regular footbathing, Routine foot trimming, Good housing, Immediate intervention, Rubber matting, Good cow tracks / walkways, Low standing times / good cow flow, Good cubicles, Being proactive, Mobility scoring, Cleanliness, Good surfaces, Good gateways, Good staff / management, Herd age profile low, Changed attitudes / more awareness, Good handling facilities, Training heifers to cubicles properly, Good loafing area, High yielding herd, Breed / breeding, Low yielding system, Nutrition

x-axis: 0, 5, 10, 15, 20, 25, 30 — % of replies mentioning each item

Legend: ■ Plan Farms   □ Control Farms

2.19 In the past 12 months, what measures have you undertaken to improve cattle mobility on your farm? (Answer - tick from list):

Note:

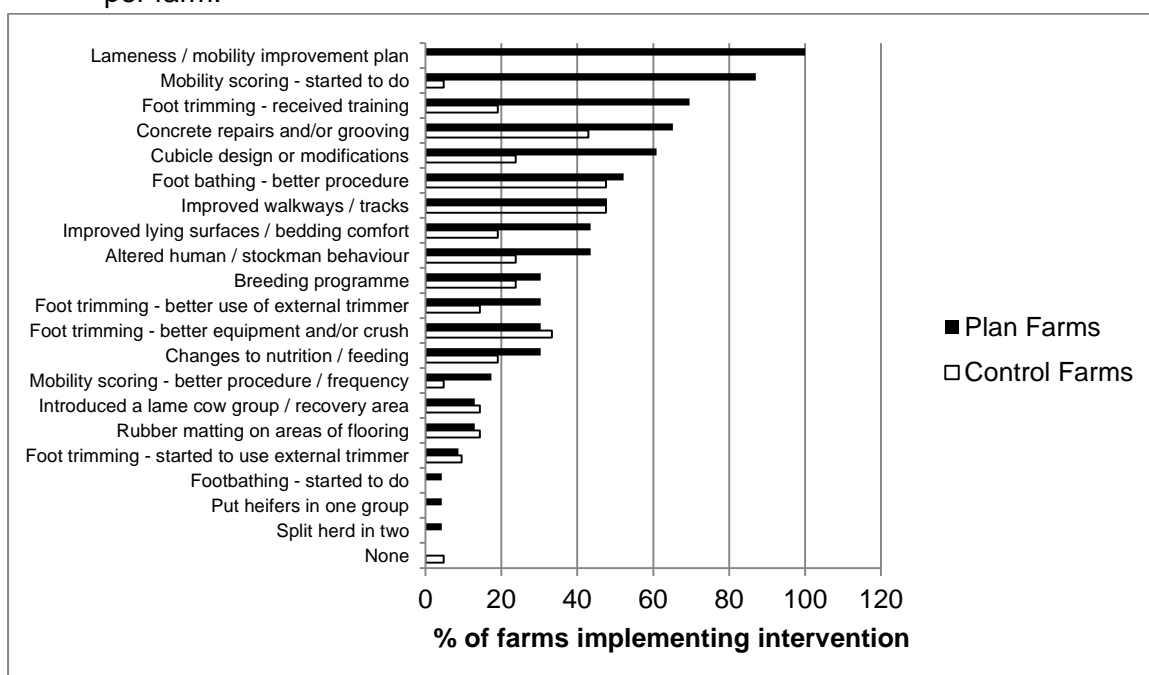➢ The 23 Plan Farms with responses made a total of 182 interventions in the last 12 months – 7.91 per farm.
➢ The 21 Control Farms made a total of 80 interventions in the last 12 months – 3.81 per farm.

The chart's y-axis (top to bottom): Lameness / mobility improvement plan, Mobility scoring - started to do, Foot trimming - received training, Concrete repairs and/or grooving, Cubicle design or modifications, Foot bathing - better procedure, Improved walkways / tracks, Improved lying surfaces / bedding comfort, Altered human / stockman behaviour, Breeding programme, Foot trimming - better use of external trimmer, Foot trimming - better equipment and/or crush, Changes to nutrition / feeding, Mobility scoring - better procedure / frequency, Introduced a lame cow group / recovery area, Rubber matting on areas of flooring, Foot trimming - started to use external trimmer, Footbathing - started to do, Put heifers in one group, Split herd in two, None

x-axis: 0, 20, 40, 60, 80, 100, 120 — % of farms implementing intervention

Legend: ■ Plan Farms   □ Control Farms

2.20 If you are going to make changes to improve cattle mobility in the near future, in what areas will these be? (*Answer - tick from list):*

Note:

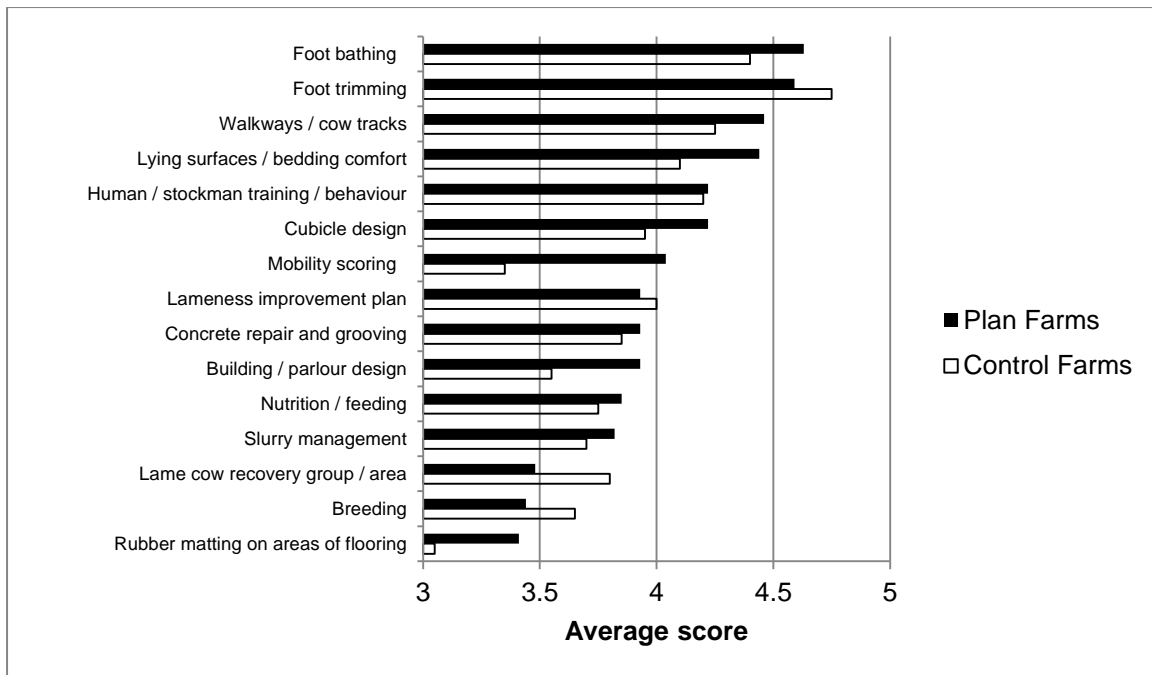- ➢ The 23 Plan Farms with responses plan to make a total of 52 – 2.26 per farm. Two Plan Farms (8.7%) do not plan any interventions.
- ➢ The 21 Control Farms plan to make a total of 46 interventions– 2.19 per farm. Five Control Farms (23.8%) do not plan any interventions. Therefore, the average number of interventions planned on the remaining 16 Control Farms is 2.88 per farm.

2.21 On a scale of 1 to 5, where 1 = not important and 5 = extremely important, how would you score the following issues in relation to how important they are for improving cattle mobility? (*Answer - 1 to 5 for each element):*

Average score chart showing Plan Farms and Control Farms for various lameness-related elements.

SECTION 3 – Motivations

3.1 Thinking about your dairy enterprise, please describe your key business objectives? (Answer - open):

% respondents using element in response chart showing Plan Farms and Control Farms for various business objectives.
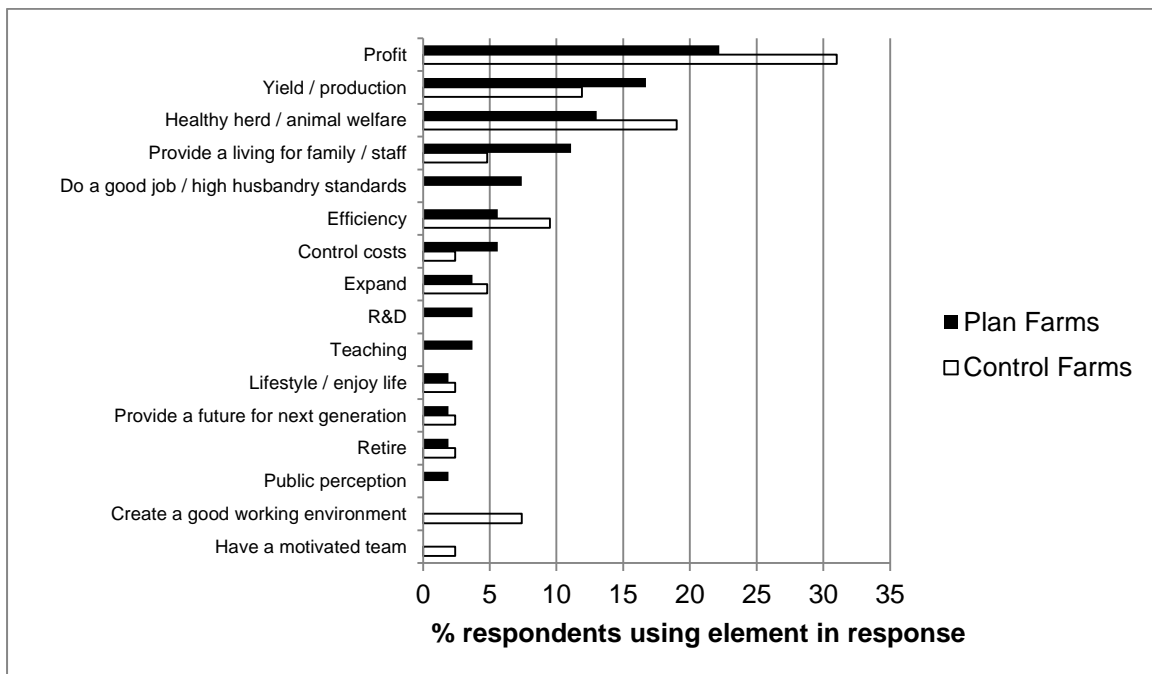
3.2 Please score from 1 to 5 the following statements as they apply to you (where 1 = does not apply to me at all, and 5 = applies to me completely). (*Answer - score):*

3.3 Please score the following aspects of animal health in your farm management (where 1 = not important, and 5 = extremely important). (*Answer -1 to 5 for each aspect):*

3.4 The following is a list of negative outcomes from lameness. Please score these from 1 to 5 (where 1 = not important, and 5 = extremely important). (*Answer - 1 to 5 for each negative outcome):*
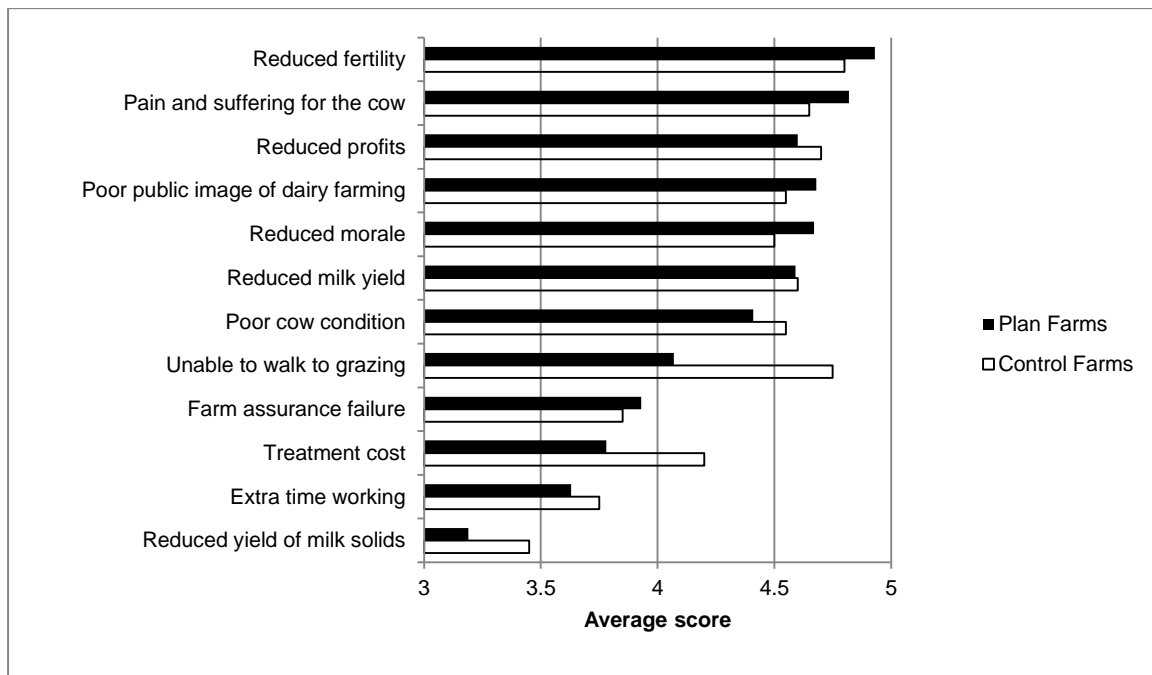
3.5 Please score the following factors in motivating you to take action in improving cattle mobility on your farm (where 1 = doesn't motivate me at all, and 5 = a very important motivating factor). (*Answer - 1 to 5 for each motivating factor):*
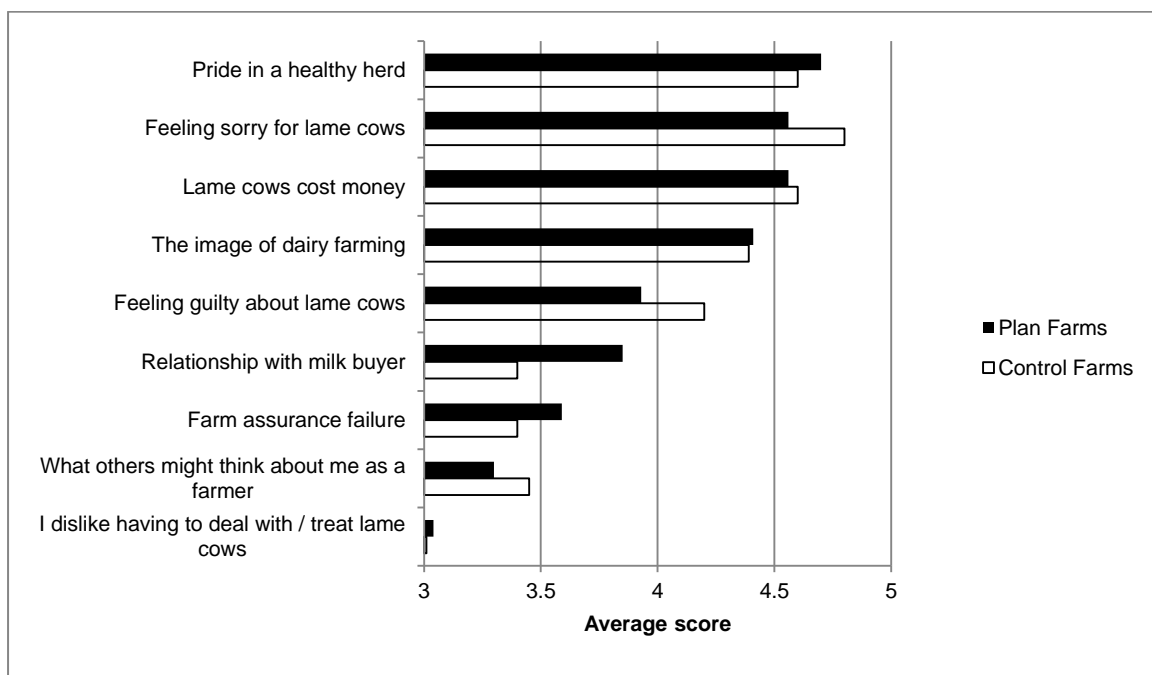
~~3.6 If you were assured that reducing lameness on your farm by 50% could save you £11,000 per 100 cows, would this provide extra motivation for you to take more action on improving cattle mobility (please score 1 to 5, where 1 = would not provide extra no motivation, and 5 = would provide the prime motivation)? (*Answer - score 1 to 5):*~~

~~Average scores:~~

> ~~PLAN FARMS   4.00~~
> ~~CONTROL FARMS   4.60~~

NOTE: The Steering Team felt that this was not a 'valid' question as question holds the front of mind response 'you'd be stupid not to…' and the point actually bneeds to be proven rather than postulated.

3.7 How useful would a **benchmarking** exercise be in motivating you to take action on cattle mobility, in which you could **compare the mobility scores from your herd with the national average, bottom 10% and top 10%?** Please answer 1 to 5, where 1 = benchmarking would not motivate me at all, and 5 = benchmarking would become my prime motivation in taking action to control mobility. (Answer - score 1 to 5):

Average scores:

> PLAN FARMS   3.79
> CONTROL FARMS   3.80

3.8 How useful would benchmarking within your herd be in motivating you to take action on cattle mobility, in which you could **compare the mobility scores from your herd over time against a target?** Please answer 1 to 5, where 1 = benchmarking within my herd would not motivate me at all, and 5 = benchmarking within my herd would become my prime motivation in taking action to control mobility. (Answer - score 1 to 5):

Average scores:

> PLAN FARMS   4.37
> CONTROL FARMS   3.55

3.9 If your milk buyer were to offer a financial incentive to maintain low levels of lameness on your farm, such as an increased milk price for less than 10% lame cows and a milk price penalty for more than 30% lame cows, how much would this motivate you to take action? Please score each of the following between 1 = no extra motivation and 5 = would be a prime motivator. *(Answer - score 1 to 5):*

Average scores:

> PLAN FARMS   3.96
> CONTROL FARMS   3.80
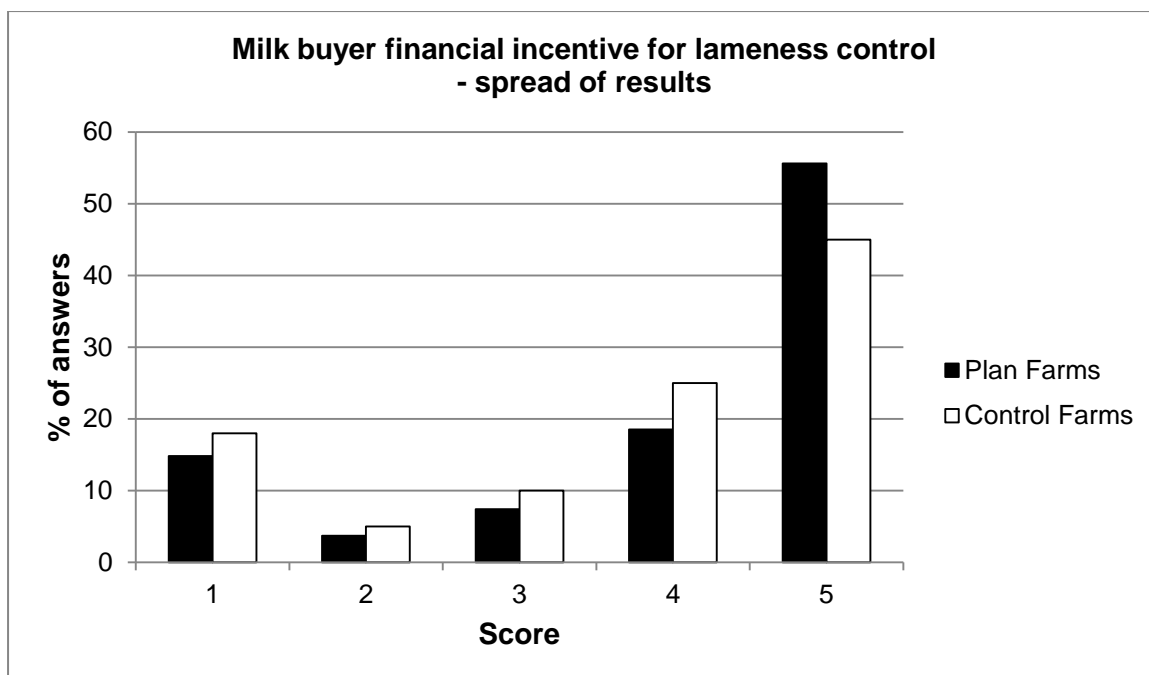
Milk buyer financial incentive for lameness control - spread of results

SECTION 4 – Barriers

4.1 Thinking about the circumstances and situation of your own farm, what would you say are the main barriers that restrict you taking action to improve cattle mobility? (*Answer - open):*
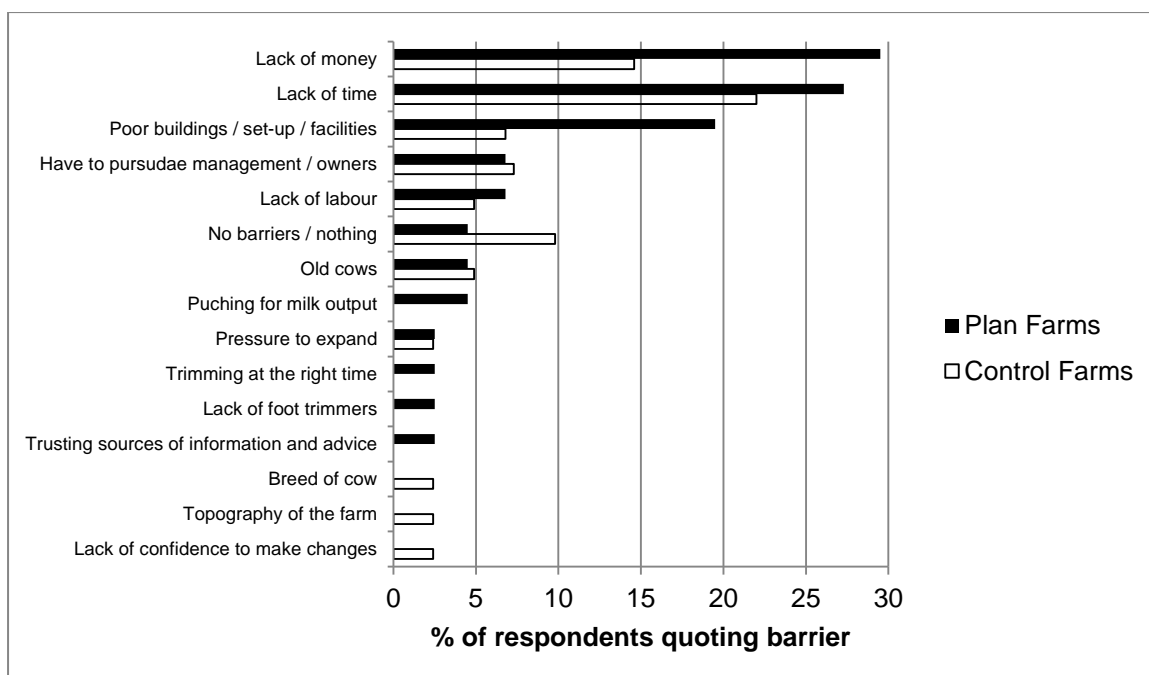
4.2 Score the following reasons as restrictions on taking action to improve cattle mobility from 1 to 5 (where 1 = not a barrier, and 5 = a major barrier). (*Answer - score 1 to 5 for each reason):*

4.3 Thinking about you personally, what would you say are the main barriers that hold you back from taking action to improve cattle mobility? (*Answer - open):*
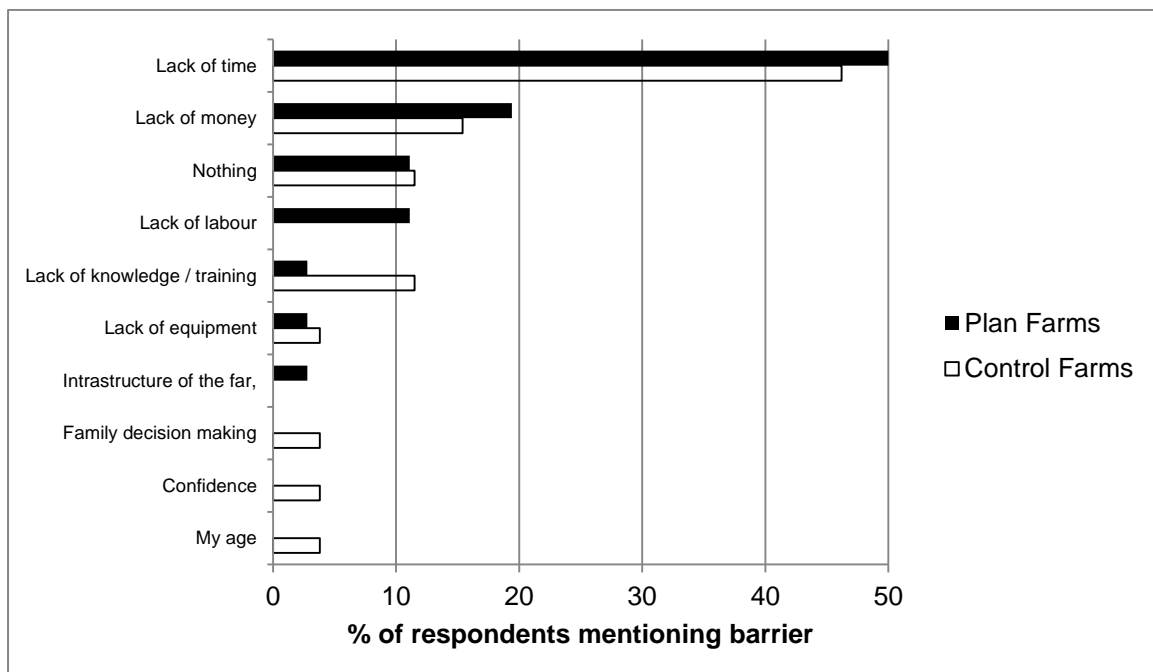
4.4 Score the following reasons that might hold you back personally from taking action to improve cattle mobility from 1 to 5 (where 1 = not a barrier, and 5 = a major barrier). *Answer - score 1 to 5 for each reason):*
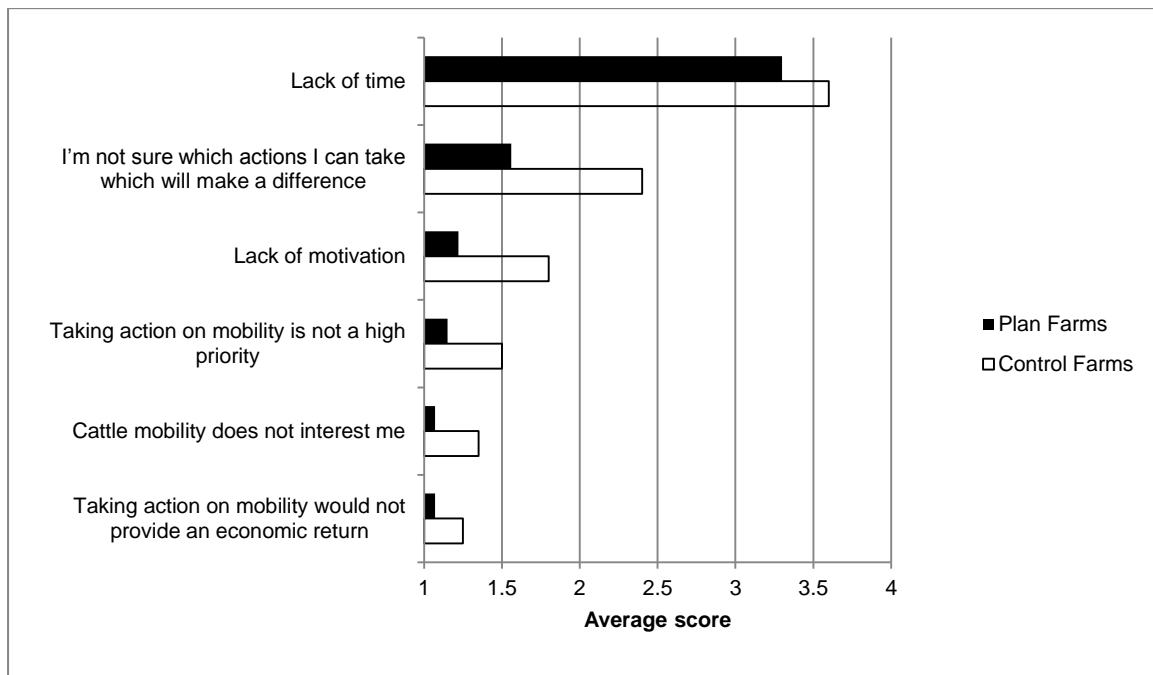
SECTION 5 – The DairyCo Healthy Feet Programme

5.1.1 Thinking about your experience of the DHFP, please score the following aspects from 1 to 5 (where 1 = not useful, to 5 = extremely useful). *(Answer - score 1 to 5 for each aspect):*
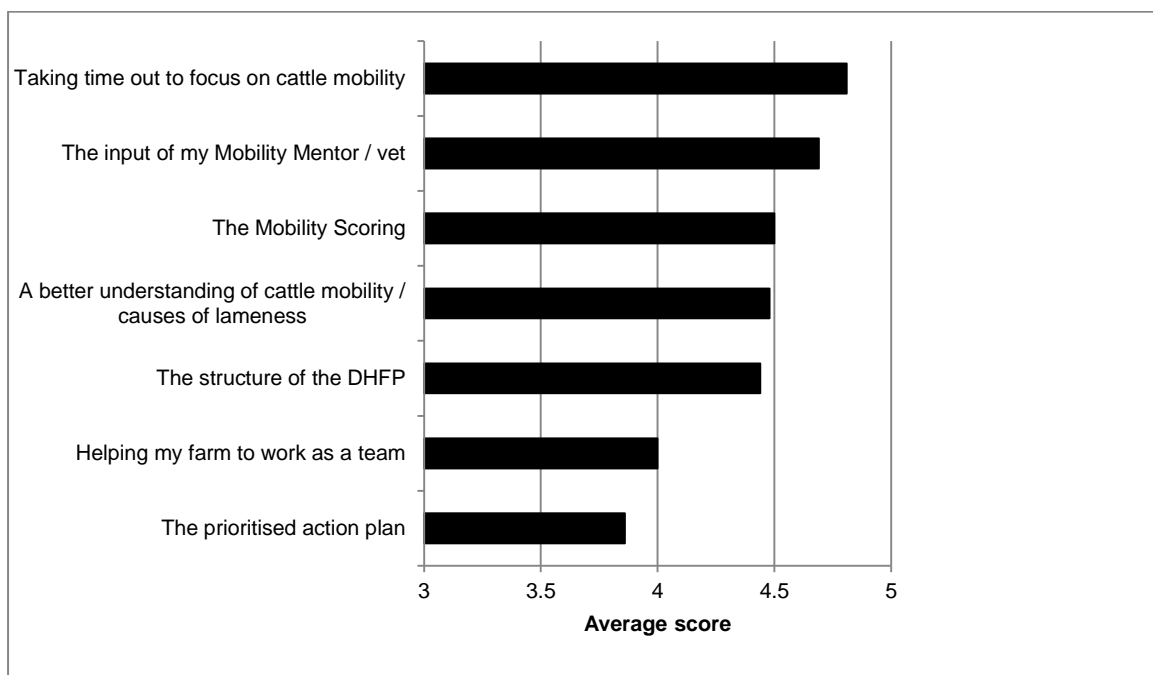
5.1.2 What was the best thing(s) about the DHFP? *(Answer – open):*
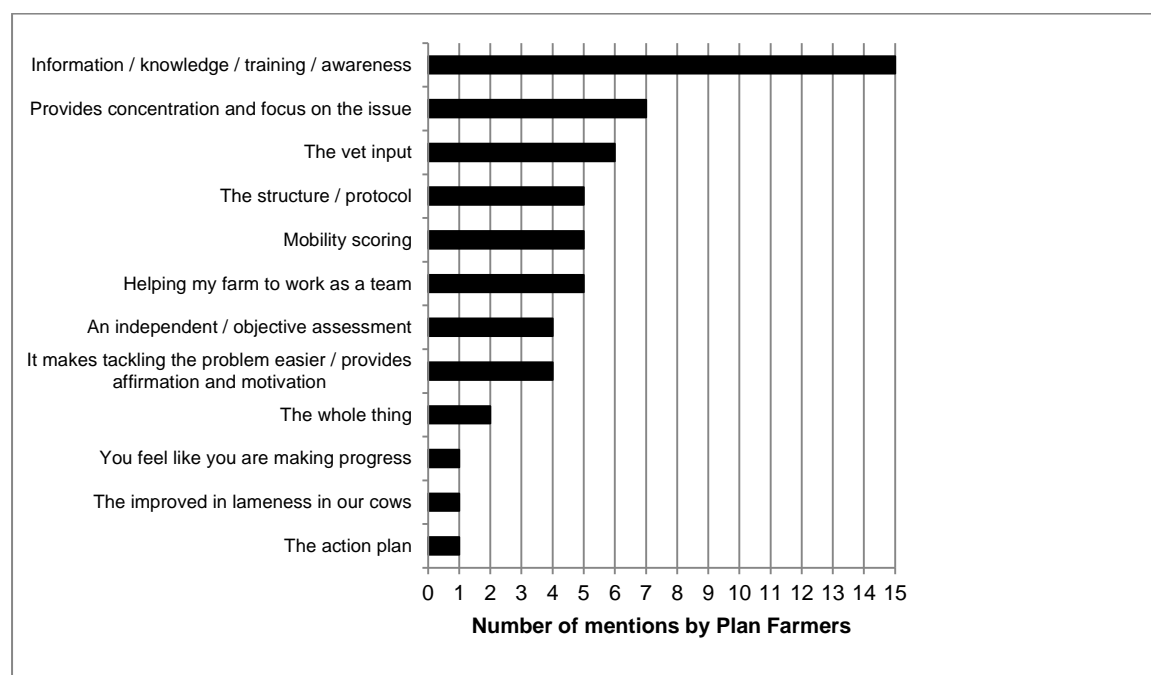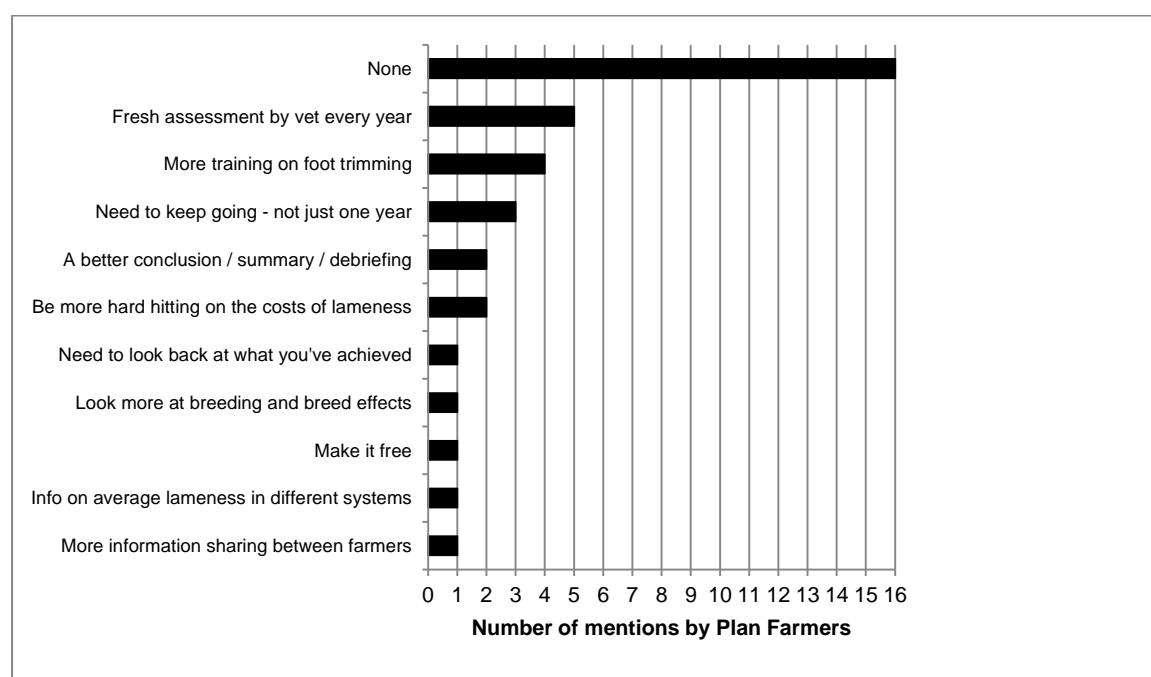
Number of mentions by Plan Farmers

5.2 What suggestions do you have to improve the DHFP? (*Answer - open):*

Number of mentions by Plan Farmers

5.3 How likely are you to recommend the DHFP to other farmers? Please provide a score from 1 to 5 (where 1 = I would not recommend the DHFP to anyone, to 5 = I would very highly recommend the DHFP to other farmers). *(Answer - score 1 to 5):*

Average score was 4.37 (range 2 to 5).

5.4 How likely are you to continue with the DHFP? Please provide a score from 1 to 5 (where 1 = I will not continue with the DHFP, to 5 = I will definitely continue with the DHFP). *(Answer - score 1 to 5):*

Average score was 3.89 (range 1 to 5).

5.5 If you are definitely, or are considering, not continuing with the DHFP, please give you reason(s). *(Answer - open):*

Only a few comments were made (shown below with number of mentions in brackets):

- ➢ It depends on the cost of continuing (2)
- ➢ It's just shown us what we already know (2)
- ➢ I'll do the work, but I don't need the plan (1)
- ➢ It just fizzled out (1)
- ➢ I don't even know if it has finished; communications could have been better (1)
- ➢ We'll pick it up again if things deteriorate (1)

5.6 How do you rate the DHFP as 'value for money'? Please score from 1 to 5 (where 1 = poor value for money, and 5 = excellent value for money). *(Answer - score 1 to 5):*

Average score was 4.33 (range 1 to 5). However, it should be noted that:

- ➢ 50% of the respondents stated that their score in answer to this question was influenced by their receipt of RDPE funding (70% of cost covered).
- ➢ 35% of respondents said that they would not do the DHFP without the funding.
- ➢ 20% of respondents explicitly stated that they would pay for the plan regardless of the funding.

5.7 Has your attitude to mobility/lameness changed as a result of the DHFP? *(Answer: Yes/No)*

If Yes, how has your attitude changed? *(Answer - open):*

80% of respondents from Plan Farms said that their attitude to lameness had changed through doing the DHFP. The reasons stated were:
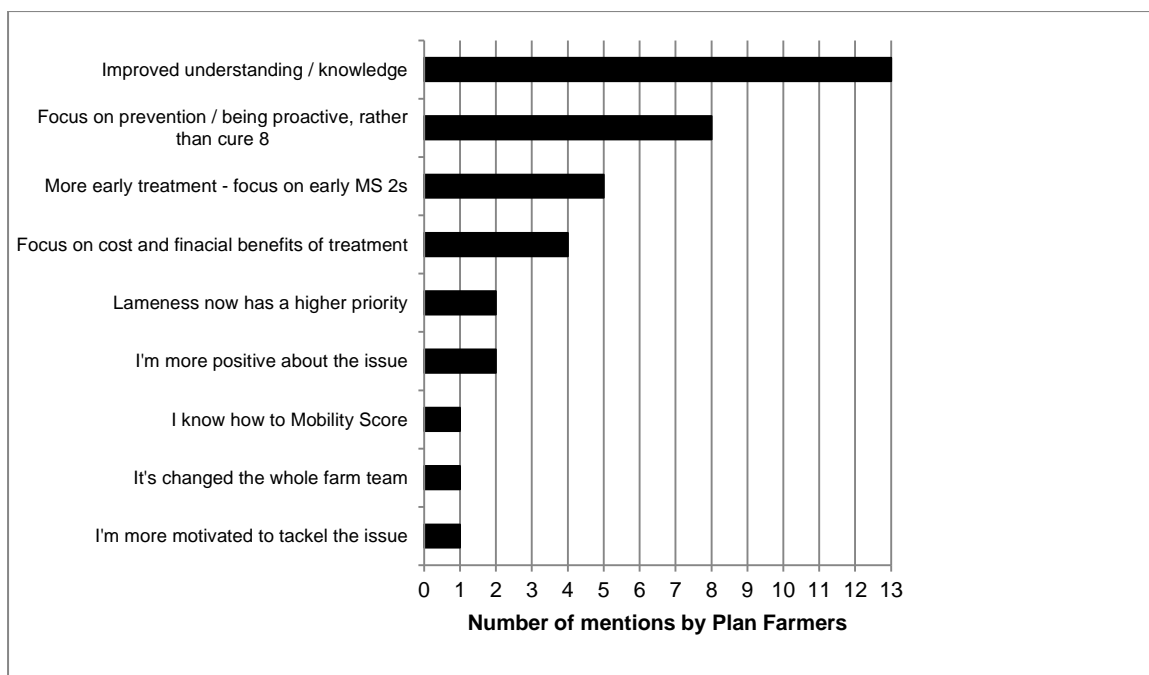
Improved understanding / knowledge

Focus on prevention / being proactive, rather than cure 8

More early treatment - focus on early MS 2s

Focus on cost and finacial benefits of treatment

Lameness now has a higher priority

I'm more positive about the issue

I know how to Mobility Score

It's changed the whole farm team

I'm more motivated to tackle the issue

0 1 2 3 4 5 6 7 8 9 10 11 12 13

Number of mentions by Plan Farmers

5.8 Have you heard of the DairyCo Healthy Feet Plan? (*Answer: Yes/No*)

If yes, what do you understand the DHFP to be? (Answer – open):

85% of respondents from Control Farm had heard of the DHFP. However, 80% of these (who answered 'yeas') could not provide any detail of what the DHFP was or did. The 20% that could say something about the DHFP stated:

> ➢ 'Come and have a look and mentor you to improve it.'
> ➢ 'Trying to help dairy farmers tackle lameness.'
> ➢ 'It uses mobility scoring.'
> ➢ 'How to improve and help you along.'

5.9 Are you aware of the any other lameness control Plan? *(Answer: Yes/No)*

If yes, what are they? *(Answer – open):*

95% of respondents from Control Farms were not aware of any other lameness control programmes. The one response 'yes' answered, 'Interherd'.

Other comments offered by Plan Farmers:

> ➢ The HFP is a starting point. We need benchmarking or something to keep the momentum going - this would lead to a sense of reward.
> ➢ We need to benchmark incidence and/or cost reductions as a result of improvement.
> ➢ My knowledge on lameness has improved because of the HFP and because of Owen's work.
> ➢ The DHFP is really good. The structure is good.
> ➢ There is not a lot of spare cash so even if you see the benefits, it's not always possible to do anything, e.g. new cubicles.

- It's hard for the guys with 250 - 350 cows, they don't have the time to devote to the issue and they don't have the business size to invest in improvements.
- We will implement what we have learnt and the programme has left us feeling more confident.
- We did the programme to help Mike (the vet) and understand our rate of lameness and how we can improve it.
- I did the DHFP because it's good to learn new things and my brother and vet encouraged me.
- We did the DHFP because we read about it and our vet encouraged us and we thought the DHFP was good for staff motivation, but it turned the other way when big improvements weren't made.
- I'm not sure the DHFP makes much difference, it's the system type that governs lameness.
- Re information that's available - there is so much of it and the opinions on what you should do vary so much.
- The trimmers can sometimes just be interested in cow numbers and not quality of work.
- We are with Tesco's and they impose a penalty if we don't submit scores and they have been in to spot-check.
- I got a lot out of it, but not sure the rest of the staff did - there could have been more input from the vet with more enthusiasm.
- Jonny's enthusiasm was the key.
- A vet you can trust. Training session we did with Owen was excellent.

APPENDIX 9 – End interview questionnaire quartile analyses

Farm details

	Characteristic over the 12 months of the project mobility scoring			
	Highest average lameness	**Lowest average lameness**	**Increase lameness most**	**Decrease lameness most**
Cow numbers (average)	257	295	306	310
Cow numbers (range)	72 to 500	110 to 500	138 to 500	110 - 500
Yield (litres per cow average)	8,625	8,940	8,490	9,240
Yield (litres per cow range)	6,500 to 10,600	5,000 to 11,000	5,000 to 10,600	8,000 to 11,000
Number of AYR systems	9	7	9	8
Number of block calving systems	1	3	1	2
Number of Plan Farms	4	6	2	6
Number of Control Farms	6	4	8	4

Mobility score details

Highest vs Lowest Lameness (scores 2+3)

	Highest lameness (n=10)			Lowest lameness (n=10)			
	Average % Lame	**Range**	**±SEM**	**Average % Lame**	**Range**	**±SEM**	**Diff.**
Start MS	41.2	30 – 60	2.93	19.3	0 – 30	2.82	NS
End MS	44.3	28 – 55	2.60	14.1	0 – 24	2.28	NS
Average over 12 months	40.8	35 – 47	1.27	16.9	0 – 23	2.27	NS

Highest vs Lowest severely lame (score 3)

	Highest lameness (n=10)			Lowest lameness (n=10)			
	Average score 3	**Range**	**±SEM**	**Average score 3**	**Range**	**±SEM**	**Diff.**
Start MS	11.5	1 – 17	1.59	4.0	0 – 10	1.12	*P*<0.01
End MS	15.9	0 – 26	2.48	3.1	0 – 12	1.15	*P*<0.001

Increased vs Decreased Lameness (scores 2+3)

	Largest increase (n=10)			Largest decrease (n=10)			
	Average % Lame	Range	+SEM	Average % Lame	Range	+SEM	Diff.
Start MS	30.4	18 – 50	2.91	37.5	22 – 56	3.32	NS
End MS	40.3	30 – 55	3.19	17.5	7 – 28	2.14	NS
% change over 12 months	+36.4*	+10 – +52	4.16	-52.5*	-30 – -77	5.35	NS

*Average % change in lameness over the 12 months of the project mobility scoring

Increase vs Decrease Lameness (score 3)

	Largest increase (n=10)			Largest decrease (n=10)			
	Average score 3	Range	+SEM	Average score 3	Range	+SEM	Diff.
Start MS	9.4	6 – 16	1.28	12.7	1 – 34	3.22	NS
End MS	12.0	4 – 19	1.51	3.9	0 – 8	0.81	*P*<0.001

SECTION 1 – Your opinions on cattle mobility and the dairy industry

1.2   In what ways (why) is lameness/ cattle mobility important in the industry? (Answer - open)

A horizontal bar chart. Y-axis categories (top to bottom): Reduces production, Public perception/image, Reduces fertility, Reduces longevity, Animal health and welfare, Lameness effects everything, Condition/weight loss, Reduces profitability, Adds to costs, Farmer morale/pride, Effects immune system, Retailers don't want. X-axis: % of replies mentioning each issue (0 to 80). Legend: Decreased lameness most; Increased lameness most.
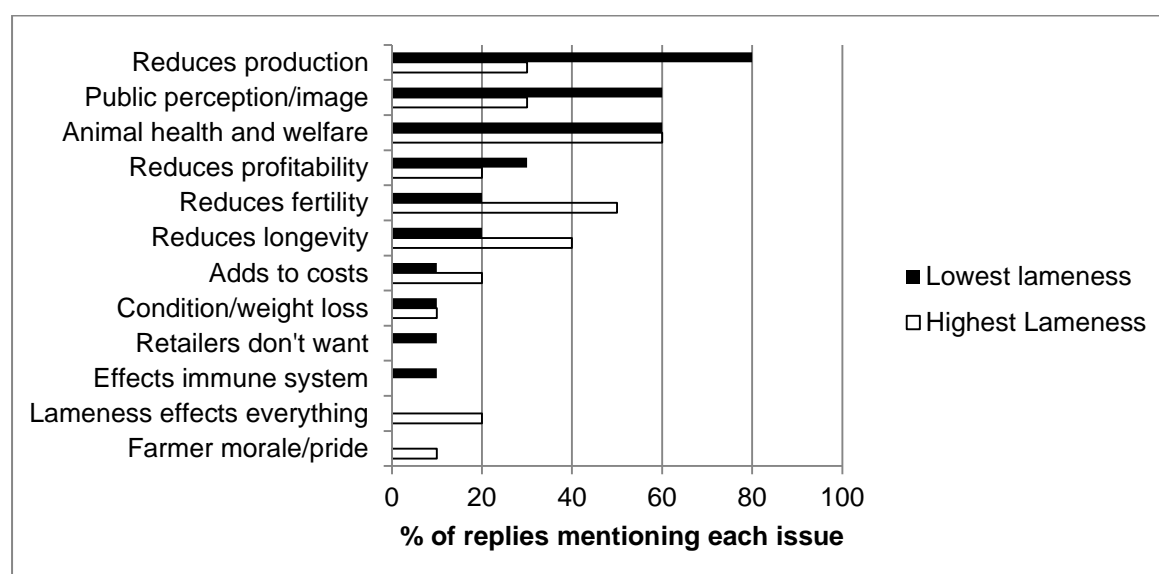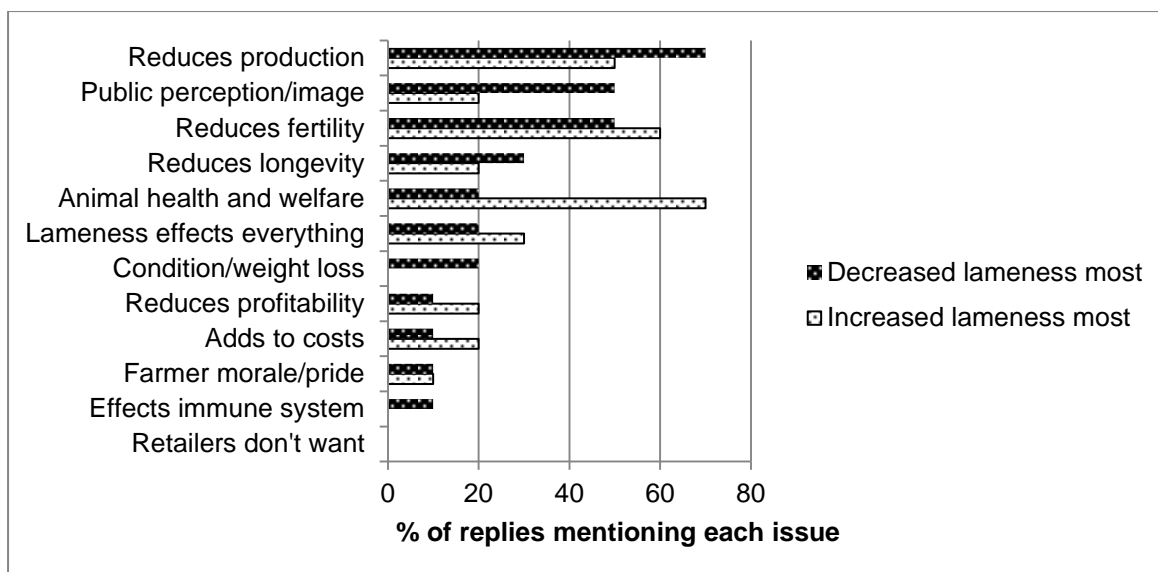
1.4   What does the industry do well in tackling mobility issues? (Answer - open):

There were no clear differences in answers to this question from the quartiles, although proactive vets were mention more by those that had lowest lameness (50% vs 20%) compared to those with highest lameness, and also by those that decreased lameness most (40% vs 20%) compared with farms where lameness increased the most.
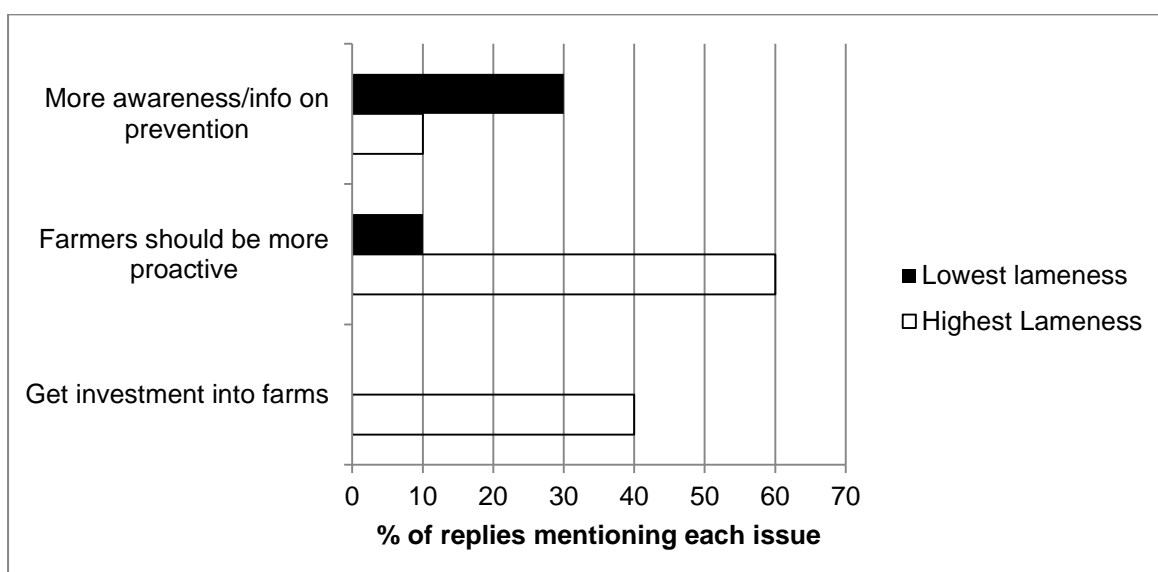
1.5   What could the industry do better to improve cattle mobility? (Answer - open):

There were only three areas that showed differences between quartiles and these are shown below: (Those with highest lameness call for proactive farmers and more investment; those that decreased lameness most call for more awareness and information on prevention).
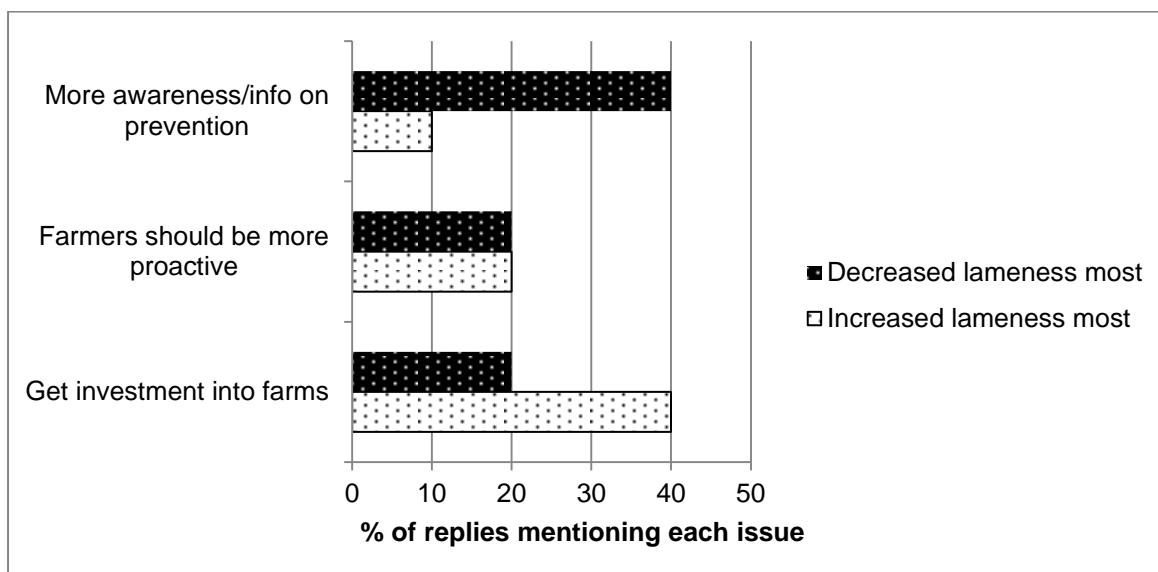
A horizontal bar chart. Y-axis categories: More awareness/info on prevention, Farmers should be more proactive, Get investment into farms. X-axis: % of replies mentioning each issue (0 to 70). Legend: Lowest lameness; Highest Lameness.

1.6   In your opinion, what stops the British Dairy Industry from doing more to improve cattle mobility? (Answer - open):

*There were only three areas that showed differences between quartiles and these are shown below: (Those with lowest lameness and those that decreased lameness the most felt more that farmers don't see lameness control as an investment that there is a lack of time in the industry to tackle the issue. Those that decreased lameness the most also feel more that farmers cut corners and/or ignore the issue).*
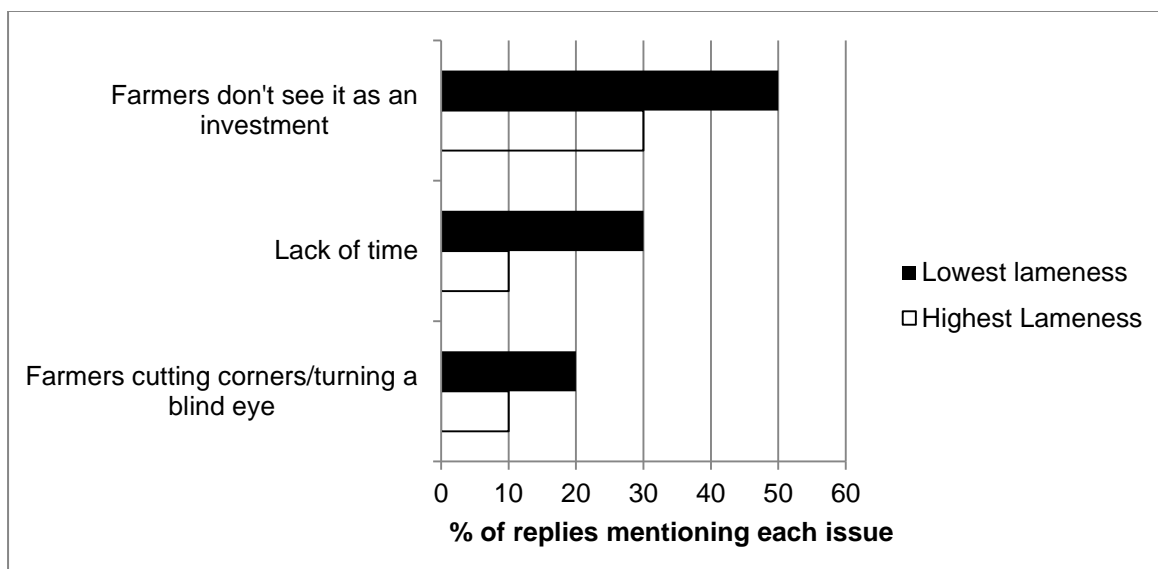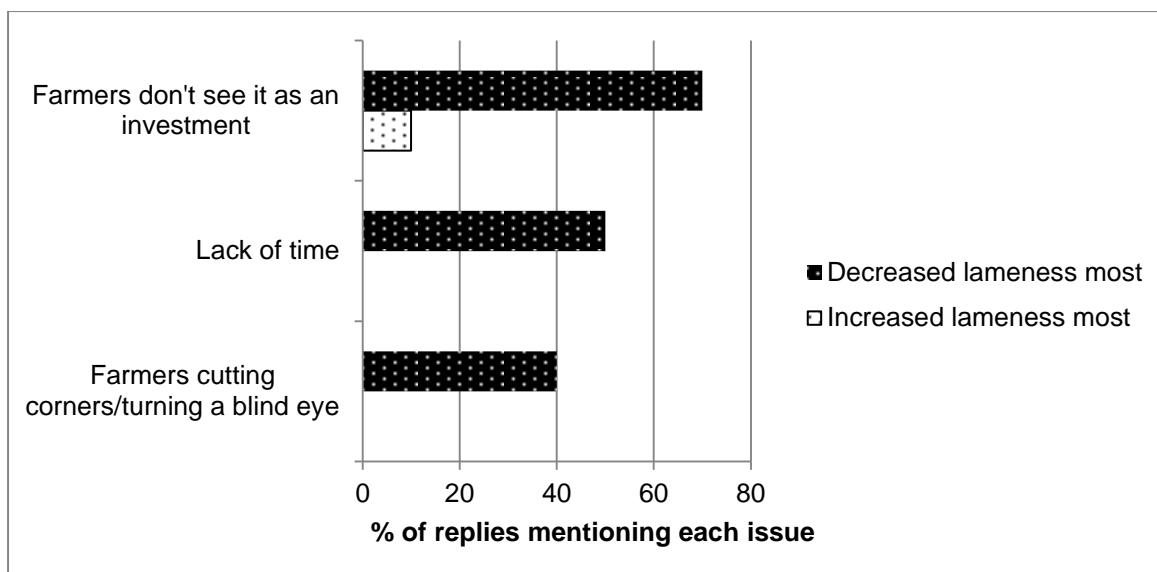
1.7   What do you think is the average rate / incidence of lameness on British dairy farms (cows with mobility score 2 and 3)? (Answer - % incidence / rate of lameness):

No difference in opinion between lowest vs highest lameness, but those that decreased lameness most tend to think that national lameness is higher than those that had the biggest increase in lameness (are they more in the 'know'?)

	Highest lameness	**Lowest lameness**	**Increased lameness most**	**Decreased lameness most**
Average	29.8	28.0	24.3	30.5
Range	2.5 to 50	2 to 70	2.5 to 50	12 to 50

1.8   In your opinion, what should be the target rate / incidence for lameness on British dairy farms? (Answer - % incidence / rate of lameness):

No difference in opinion between most increased vs most decreased, but those with lowest average lameness over the year tend to think that national lameness target levels should be lower than those that had the highest lameness (do they instinctively know they are 'good'?)

	Highest lameness	**Lowest lameness**	**Increased lameness most**	**Decreased lameness most**
Average	13.4	8.0	8.4	8.5
Range	1 to 30	0 to 20	1 to 20	5 to 15

SECTION 2 – Your understanding of cattle mobility

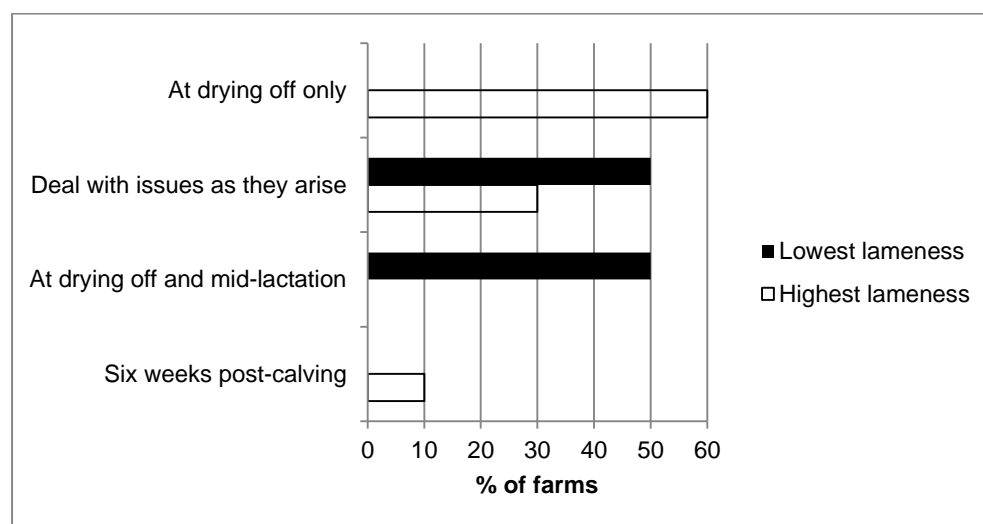2.3 Thinking of your farm, who works/interacts with you to improve cattle mobility?
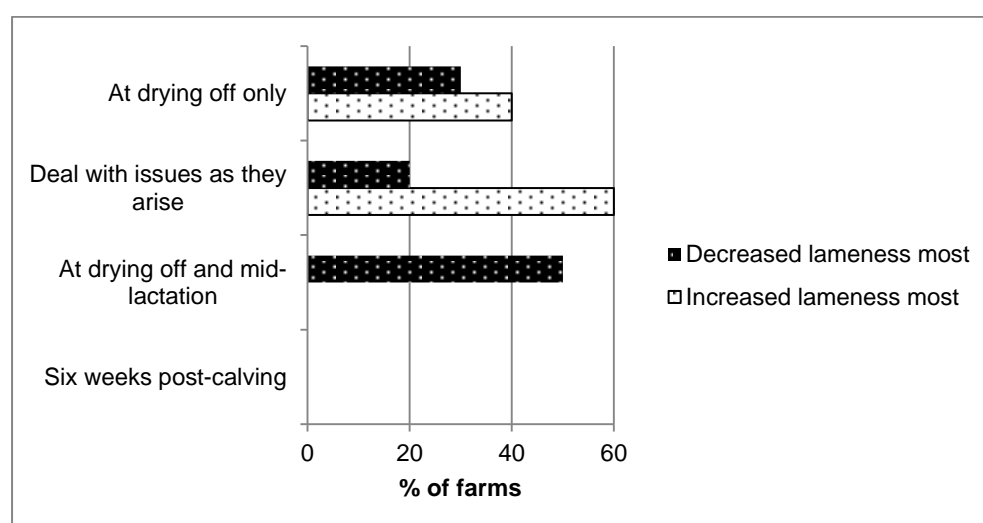
No differences between quartiles.

2.5 What is your foot trimming routine? (Answer - open):

Is mid-lactation trimming important for reducing lameness?

Farms with lowest average lameness tend to trim in mid-lactation as well as at drying off:

The farms that decreased lameness most tended to have at drying off and mid-lactation trims:

2.6 Does a foot trimmer input to your routine trimming? (Answer - open):

There were no clear differences amongst quartiles, although for farms where average lameness was the highest, 80% used a foot trimmer for routine trimming; 20% did not.

2.7 Does a vet and/or foot trimmer input to your lame cow trimming? (Answer - open):

No clear differences amongst quartiles, with around half using a vet/trimmer for lame cow work, and half not.

2.8 Levels of training in farmers, herdsmen and staff who are involved in lameness on farm

Farms where lameness decreased most tended to have more formal training, whilst those where lameness increased most tended to have no training.

Level of training (highest level of training on-farm)	% of farms			
	Highest ave lameness	Lowest ave lameness	Increased lameness most	Decreased lameness most
Nothing formal / learned from vet/farmers/foot trimmer	20	20	30	30
Recent formal course	50	50	20	50
Own experience	0	0	0	0
Formal course >10 years ago	0	10	0	10
None	30	20	50	10

2.10 Where do you get information and advice on cattle mobility?

*There were no clear differences amongst quartiles, except in the use of **specific publications on lameness**, where 50% of farms with the lowest average lameness cited this source, compared with 0% of those with the highest lameness; and 40% of farms that decreased lameness the most cited this source, compared with 10% where lameness increased the most.*

2.12   Lameness conditions and causes picture quiz

Farms where lameness was decreased the most had a significantly higher quiz score than those where lameness increased he most (10 vs 8)

Score out of 14	Highest ave lameness	Lowest ave lameness	Increased lameness most	Decreased lameness most
Average	8.5	8.4	8.1	9.9
Range	4 – 13	2 – 14	6 – 12.5	4 – 12
+SEM	0.97	1.19	0.71	0.78
Sig. diff.	NS		P<0.05	

2.13 What % lameness do you think you have on your farm (in the last 12 months)? (Answer - % level / rate / incidence):

Highest average lameness – Actual vs Presumed lame at end of HFP

Lowest average lameness – Actual vs Presumed lame at end of HFP

Increased lameness most – Actual vs Presumed lame at end of HFP

Decreased lameness most – Actual vs Presumed lame at end of HFP
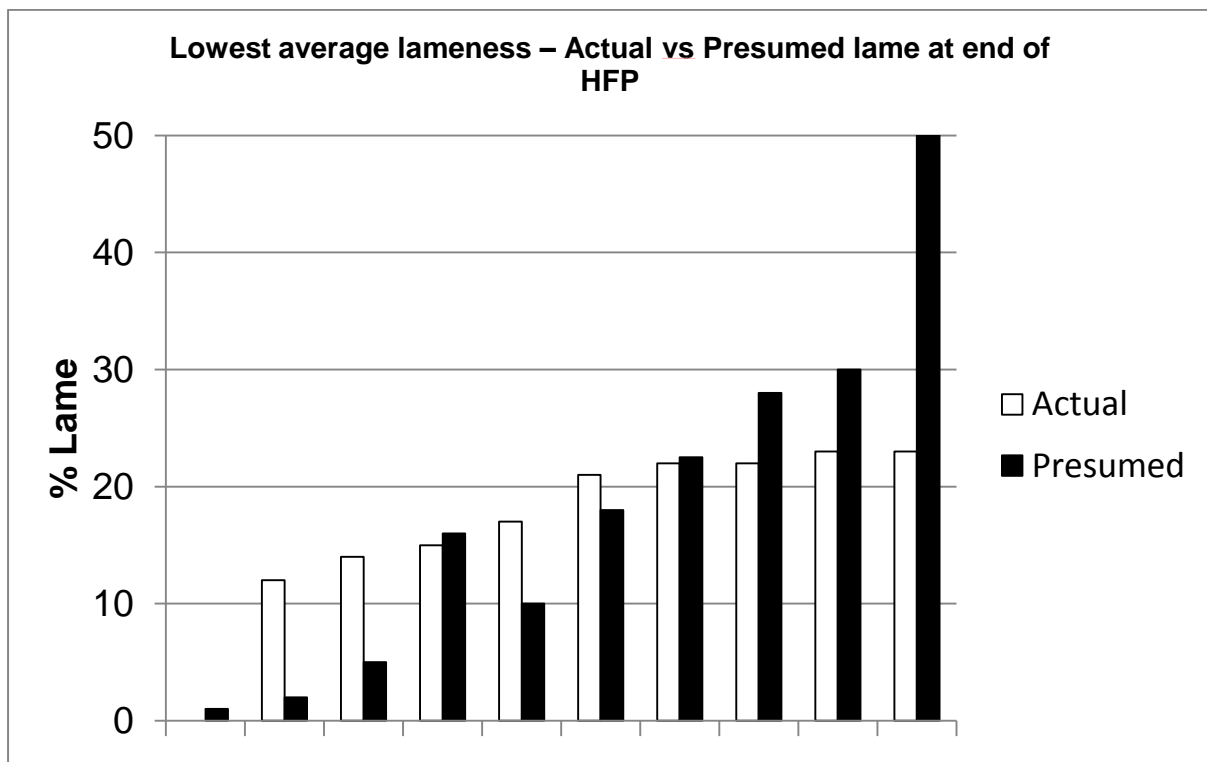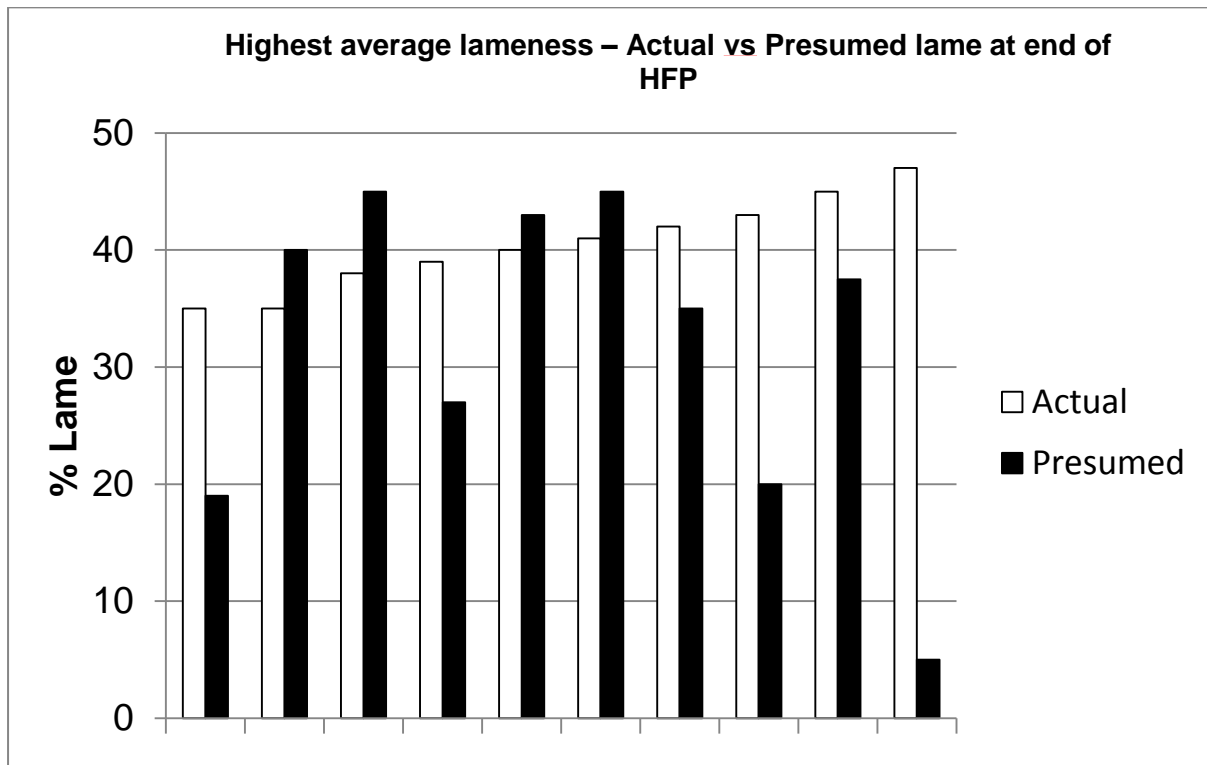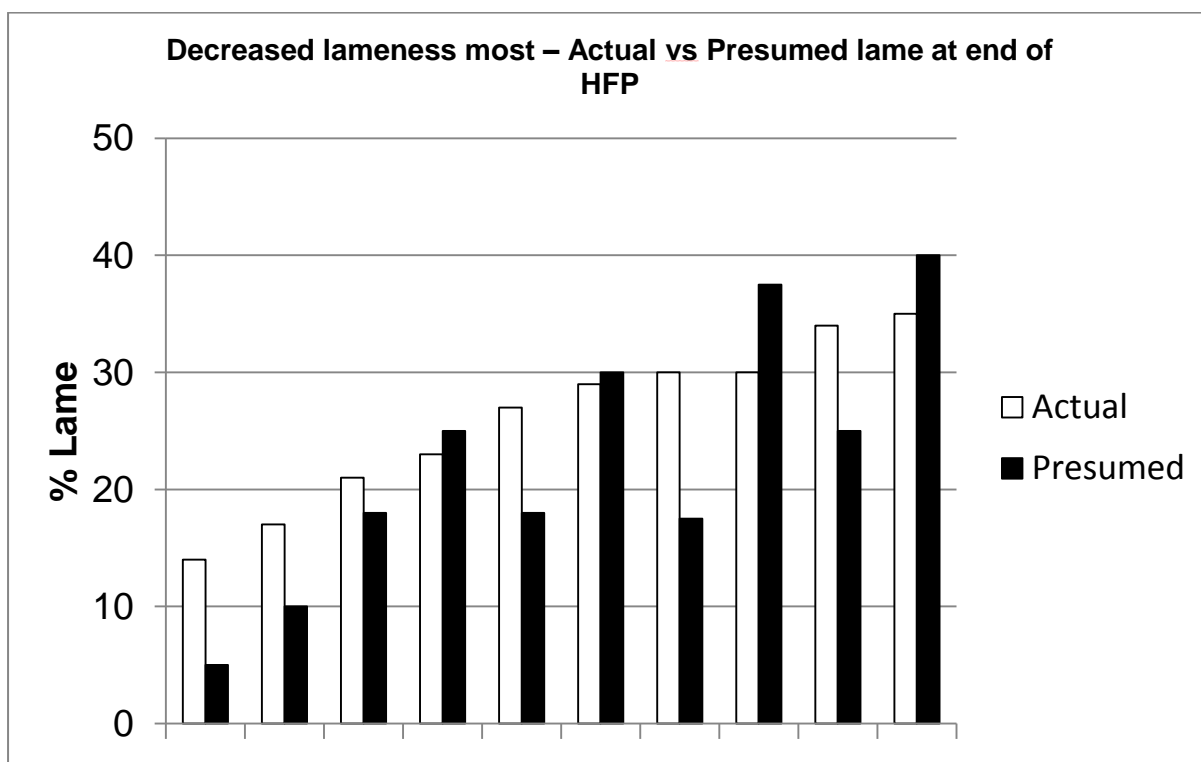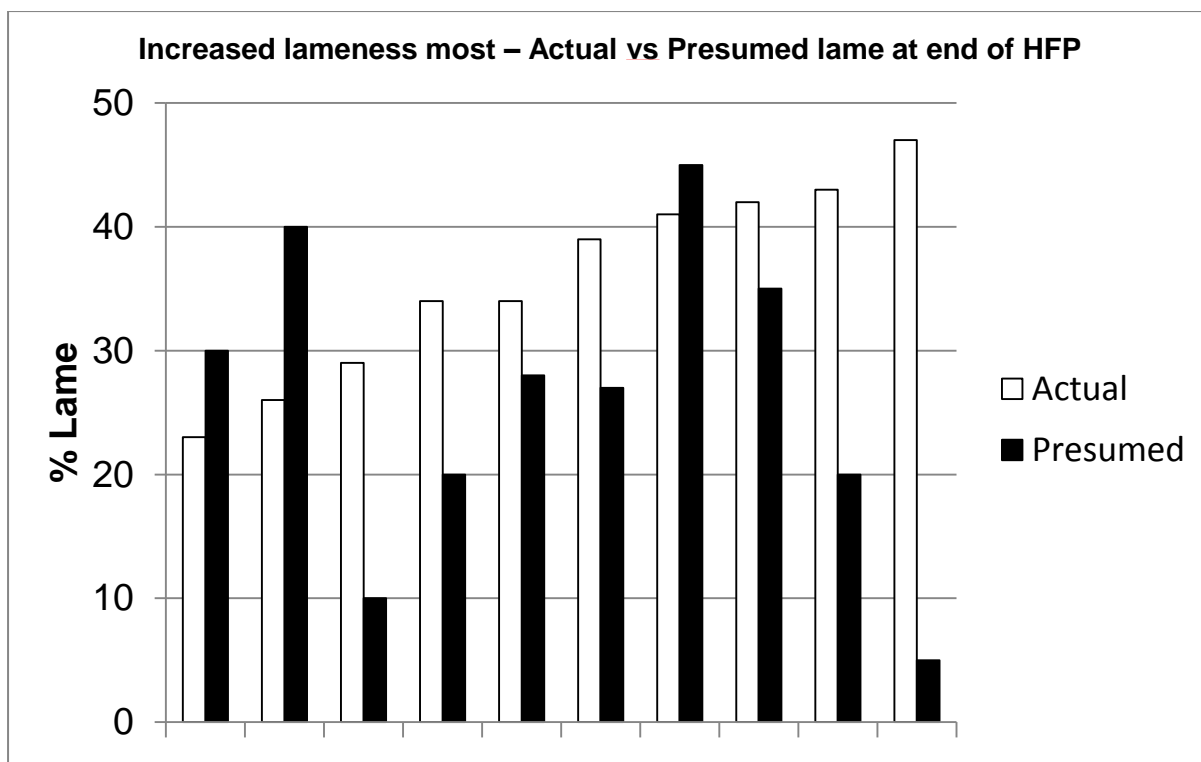
Actual vs Presumed % Lame stats

Presumed lameness incidence was closer to actual for those farms with lowest average lameness (cf. highest average lameness) and those that decreased lameness the most (cf. farmers where lameness increased the most).

Quartile	Actual*	± SEM	Presumed*	± SEM	Sig. diff.	% diff. actual to presumed
Highest ave lameness	**40.8**	1.27	**31.7**	4.25	NS	-22%
Lowest ave lameness	**16.9**	2.27	**18.3**	4.80	NS	+8%
Increased lameness most	**35.8**	2.51	**26.0**	3.98	*P<0.05*	-27%
Decreased lameness most	**26.0**	2.23	**22.6**	3.54	NS	-13%

*Note: these interviewees were asked what their presumed % lameness was over the last 12 months and the answers were compared with the actual average % lameness over that same time period – these are not the end of DHP scores.

2.15 What cost would you put YOUR herd lameness at? (Answer - ppl OR £/year OR £/cow/year):

All quartiles were significantly inaccurate in their presumption of the cost of lameness on their farms:

Calculated vs Presumed cost of lameness stats (£/cow/yr)

Quartile (and % answering 'don't know')	For respondents that answered					
	Calculated*	± SEM	Presumed*	± SEM	Sig. diff.	Presumed inaccurate by a factor of
Highest ave lameness (30%)	**322**	13.0	**131**	32.1	*P<0.001*	2.46
Lowest ave lameness (40%)	**141**	30.6	**41**	16.9	*P<0.01*	3.44
Increased lameness most (30%)	**310**	24.5	**122**	29.9	*P<0.001*	2.54
Decreased lameness most (10%)	**223**	18.4	**111**	19.8	*P<0.001*	2.01

*Note: these interviewees were asked what their presumed cost lameness was and the answers were compared with the actual calculated cost based on the average % lameness over 12 month project mobility score period – so these are not the end of DHP calculations.

2.17 What do you feel are the most important things affecting mobility in your herd? (*Answer - open):*

There were no clear differences between quartiles in the response to this question, except in relation to the state of concrete floors. % of farms citing this as an issue was as follows:

- Highest ave lameness – 40%
- Lowest ave lameness – 10%
- Increased lameness most – 30%
- Decreased lameness most – 0%

2.18 Thinking about your farm and animals, what things do you feel contribute to controlling/reducing mobility problems in your herd? (*Answer - open):*

The only differences between quartiles in the answers to this question were:

Percentage of farms citing good cow tracks and walkways as a factor reducing lameness:

- Highest ave lameness – 10%
- Lowest ave lameness – 40%
- Increased lameness most – 0%
- Decreased lameness most – 60%

Numbers of different factors quoted as improving lameness on their farms:

- Highest ave lameness – 9
- Lowest ave lameness – 14
- Increased lameness most – 8
- Decreased lameness most – 12

2.19 In the past 12 months, what measures have you undertaken to improve cattle mobility on your farm? (Answer - tick from list):

There were no differences between quartiles in the number of interventions made to improve mobility in the last 12 months, or in the types of interventions made. Summary below:

Interventions to improve lameness in the last 12 months

Quartile	Number of different interventions made (from a list of 21)	Number of total interventions made (10 farms per quartile)
Highest ave lameness	**19**	58
Lowest ave lameness	**15**	49
Increased lameness most	**18**	61
Decreased lameness most	**18**	62

2.20 If you are going to make changes to improve cattle mobility in the near future, in what areas will these be? (*Answer - tick from list):*

There were no differences between quartiles in the number of different interventions planned to improve mobility in the near future, or in the types of interventions to be made. However, those farms with highest average lameness and most increased lameness in the previous 12 months, planned more interventions (per farm) in the next period. Does this mean that these farms know they have a problem and feel that they want to tackle it, or just that the farmers that have improved the most have come to the end of an improvement phase and will reduce interventions in future? Summary below:

Interventions to improve lameness in the near future

Quartile	Number of different interventions to be made (from a list of 21)	Number of total interventions planned (10 farms per quartile)
Highest ave lameness	**14**	38
Lowest ave lameness	**14**	23
Increased lameness most	**14**	41
Decreased lameness most	**15**	22

2.21 On a scale of 1 to 5, where 1 = not important and 5 = extremely important, how would you score the following issues in relation to how important they are for improving cattle mobility? (*Answer - 1 to 5 for each element):*

In answer to this question there were mostly no differences between quartiles, except in the scores for the following issues:

- *Farms that were best at handling lameness tended to feel that rubber matting, nutrition, stockman behaviour and a lame cow recovery area were less important than those farms that were not as good in controlling lameness.*
- *Farms that were best at handling lameness tended to feel that having a lameness improvement plan was a more important issue than those farms that were not as good in controlling lameness.*

Issue questioned	Average score for the 10 farms in each quartile			
	Highest ave lameness	Lowest ave lameness	Increased lameness most	Decreased lameness most
Rubber matting on areas of flooring	3.5	2.7	3.9	3.0
Nutrition / Feeding	4.2	3.3	4.1	3.7
Human / Stockman training / behaviour	4.5	3.9	4.5	3.7
Lame cow recovery area / group	4.1	3.6	4.3	3.8
Lameness improvement plan	3.6	4.0	3.8	4.3

SECTION 3 – Motivations

3.1 Thinking about your dairy enterprise, please describe your key business objectives? (Answer - open):

There were no differences in answers between farms with highest and lowest average lameness. The clear differences between those where lameness increased or decreased the most showed that farms where lameness decreased the most were less focussed on profit (40% vs 80%) and yield (20% vs 40%) than those where lameness increased the most.

3.4 The following is a list of negative outcomes from lameness. Please score these from 1 to 5 (where 1 = not important, and 5 = extremely important). (*Answer - 1 to 5 for each negative outcome):*

The only differences between quartiles in answer to this question are shown in the table below:

Farms that were better at controlling lameness tended to feel that walking to grazing and treatment cost were less important negative outcomes of lameness. Those with lowest average lameness also felt that extra working time was a less important outcome, compared to those who had the highest average lameness.

Issue questioned	Average score for the 10 farms in each quartile			
	Highest ave lameness	Lowest ave lameness	Increased lameness most	Decreased lameness most
Unable to walk to grazing	4.7	3.5	4.7	4.2
Extra time working	4.0	3.3	3.6	3.6
Treatment cost	4.2	3.7	4.1	3.5

3.5 Please score the following factors in motivating you to take action in improving cattle mobility on your farm (where 1 = doesn't motivate me at all, and 5 = a very important motivating factor). (*Answer - 1 to 5 for each motivating factor*):

The only differences between quartiles in answer to this question are shown in the table below:

Farms that were worst at controlling lameness tended to feel more motivated by a dislike of treating cows and what others might think of them than those that were better at controlling lameness.

Issue questioned	Average score for the 10 farms in each quartile			
	Highest ave lameness	Lowest ave lameness	Increased lameness most	Decreased lameness most
I dislike having to deal with / treat lame cows	3.6	2.8	3.9	2.9
What others might think about me as a farmer	3.9	2.7	4.2	3.3

3.7 How useful would a **benchmarking** exercise be in motivating you to take action on cattle mobility, in which you could **compare the mobility scores from your herd with the national average, bottom 10% and top 10%?** Please answer 1 to 5, where 1 = benchmarking would not motivate me at all, and 5 = benchmarking would become my prime motivation in taking action to control mobility. (Answer - score 1 to 5):

No differences between highest/lowest average lameness quartiles, biut those that decreased lameness most are more motivated by national benchmarking than those where lameness increased the most - Average scores:

- Highest ave lameness – 3.4
- Lowest ave lameness – 3.5
- Increased lameness most – 3.7
- Decreased lameness most – 4.2

3.8 How useful would benchmarking within your herd be in motivating you to take action on cattle mobility, in which you could **compare the mobility scores from your herd over time against a target?** Please answer 1 to 5, where 1 = benchmarking within my herd would not motivate me at all, and 5 = benchmarking within my herd would become my prime motivation in taking action to control mobility. (Answer - score 1 to 5):

No differences between highest/lowest average lameness quartiles, but those that decreased lameness most are more motivated by within herd benchmarking than those where lameness increased the most - Average scores:

- Highest ave lameness – 3.9
- Lowest ave lameness – 3.9

- Increased lameness most – 3.5
- Decreased lameness most – 4.0

3.9 If your milk buyer were to offer a financial incentive to maintain low levels of lameness on your farm, such as an increased milk price for less than 10% lame cows and a milk price penalty for more than 30% lame cows, how much would this motivate you to take action? Please score each of the following between 1 = no extra motivation and 5 = would be a prime motivator. *(Answer - score 1 to 5):*

No differences between highest/lowest average lameness quartiles, but those that decreased lameness most are much more motivated by lameness related milk price than those where lameness increased the most - Average scores:

- Highest ave lameness – 3.5
- Lowest ave lameness – 3.6
- Increased lameness most – 3.1
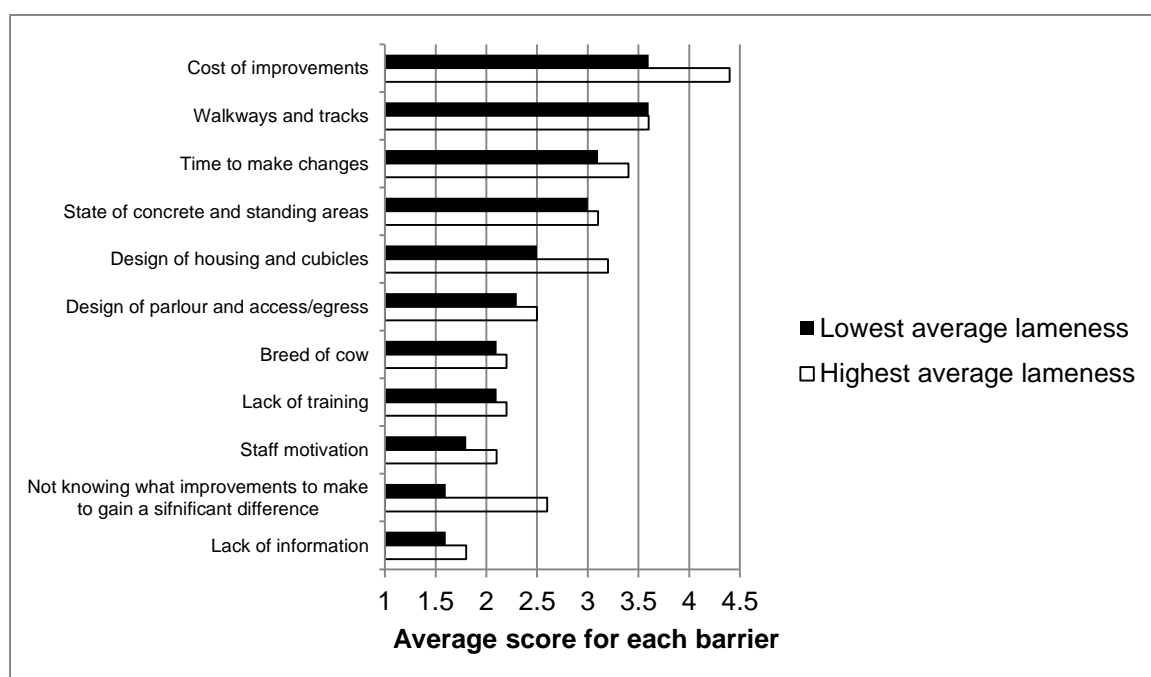- Decreased lameness most – 4.6

SECTION 4 – Barriers

4.1 Thinking about the circumstances and situation of your own farm, what would you say are the main barriers that restrict you taking action to improve cattle mobility? (*Answer - open):*

The only clear difference between quartiles in answer to this question was that 90% of farms where lameness ijncreased the most cited 'lack of money' as a barrrier, compared to only 50% of farms where lameness was decreased the most.

4.2 Score the following reasons as restrictions on taking action to improve cattle mobility from 1 to 5 (where 1 = not a barrier, and 5 = a major barrier). (*Answer - score 1 to 5 for each reason):*

Compared with farms that had the lowest average lameness, farms that had the highest lameness cited cost, housing/cubicles and not knowing what improvements to make as barriers to taking action on lameness:

Compared with farms that decreased lameness the most, farms where lameness increased the most see most factors as more of a barrier to taking action on lameness, but particularly cost, walkways, parlours, state of concrete knowing what improvements to make:
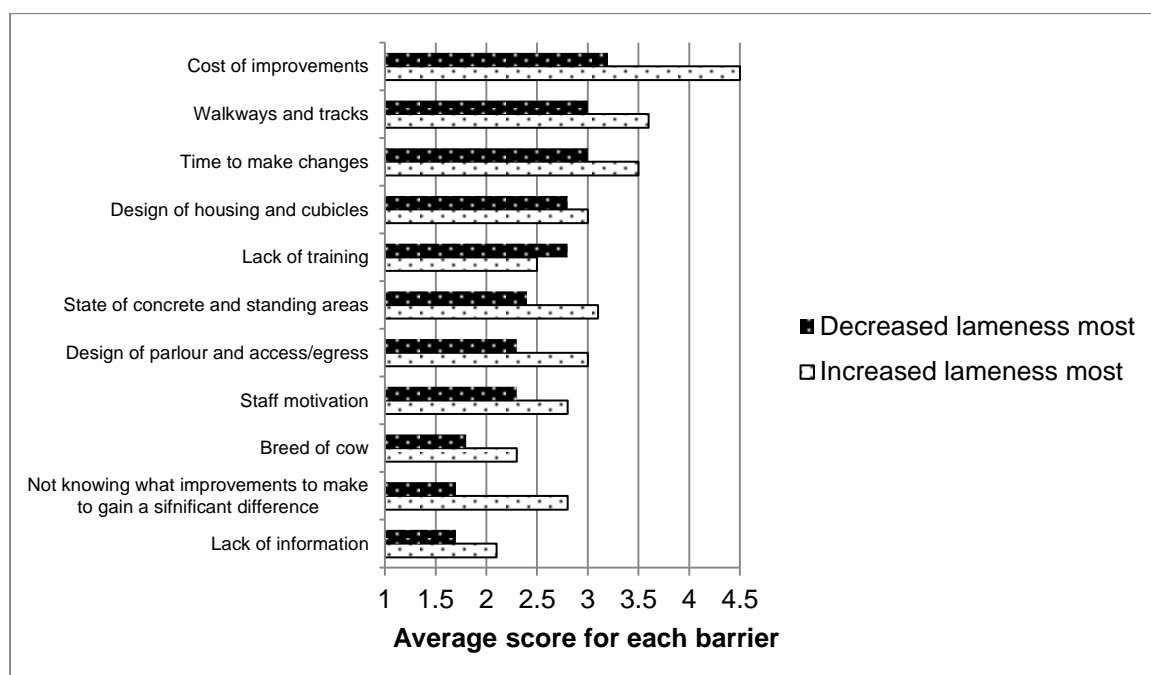
4.3 Thinking about you personally, what would you say are the main barriers that hold you back from taking action to improve cattle mobility? (*Answer - open):*

The only clear difference between quartiles in answers to this question was the response 'nothing'. 30% of those from farms with the lowest average lameness and those wehere lemaness was decreased the most said that they had no personal barriers; no one from farms with the highest averegae lameness or where lameness increased the most gave this response.

4.4 Score the following reasons that might hold you back personally from taking action to improve cattle mobility from 1 to 5 (where 1 = not a barrier, and 5 = a major barrier). *Answer - score 1 to 5 for each reason):*

Farms that had the highest average lameness find all reasons more of a personal barrier to taking action to improve lameness, compared to farms with the lowest average lameness.
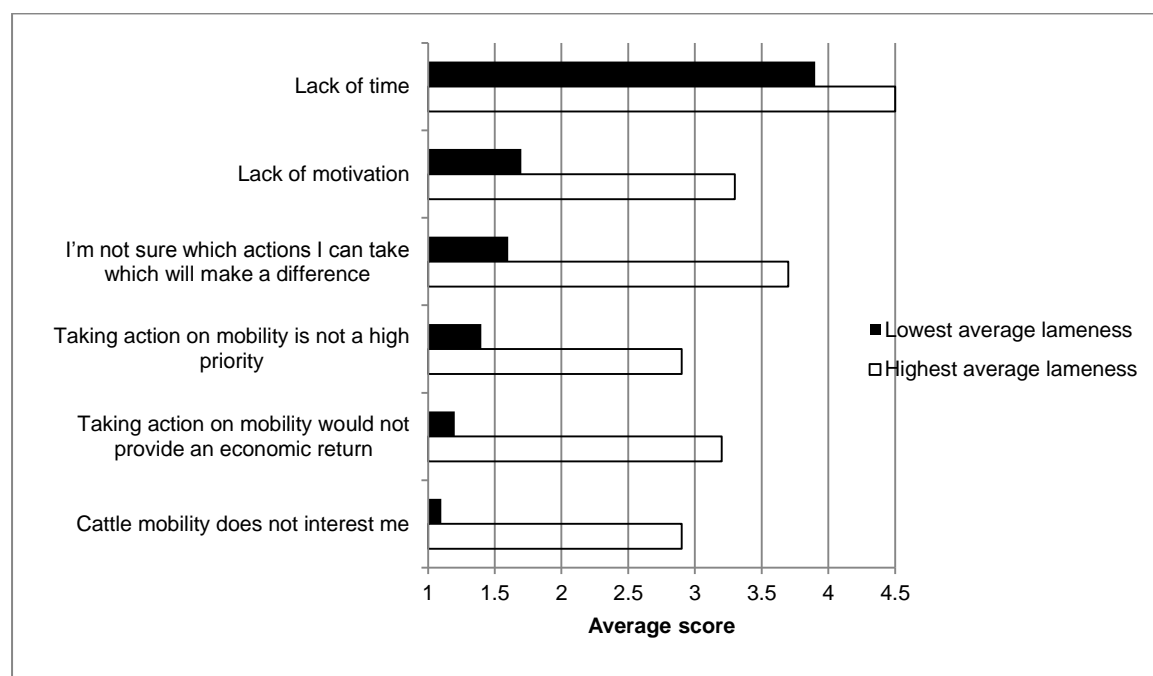
Compared with farms where lameness was decreased the most, farms where lameness increased the most cited time and surety of actions as more of a personal barrier to taking action on improving lameness.
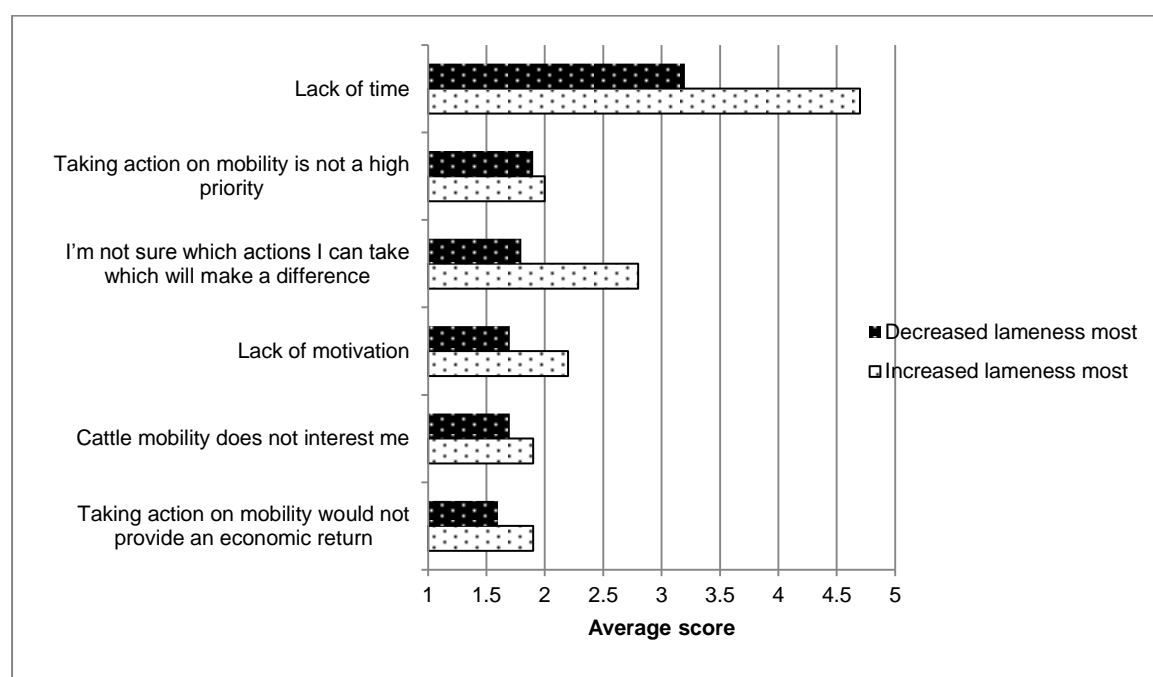
APPENDIX 10 – Seasonal variation analyses

OCTOBER TO MARCH vs APRIL TO SEPTEMBER

(No effect of season on % lame or % score 3)

% Lame (scores 2 + 3)

Group	Oct to Mar	± SEM	Apr to Sep	± SEM	Sig. Diff.
Plan	30.2	1.03	29.4	1.16	NS
Control	30.6	1.73	30.6	1.60	NS
Plan and Control	30.4	0.92	30.0	0.98	NS

% Score 3 (severely lame)

Group	Oct to Mar	± SEM	Apr to Sep	± SEM	Sig. Diff.
Plan	5.5*	0.52	5.6**	0.73	NS
Control	9.0*	0.73	9.4**	0.87	NS
Plan and Control	7.0	0.45	7.6	0.59	NS

*There was a significant difference in average score 3 results between Plan and Control farms for October to March at $P<0.01$.

** There was a significant difference in average score 3 results between Plan and Control farms for April to September at $P<0.05$.

SEPTEMBER TO MAY vs JUNE TO AUGUST

(Plan Farms had significantly lower lameness in June – August compared to September to May, but this was not reflected in the Control Farms. There were no significant differences in score 3s between seasonal)

% Lame (scores 2 + 3)

Group	Sep to May	+ SEM	Jun to Aug	+ SEM	Sig. Diff.
Plan	29.4	1.21	25.9	1.84	*P*<0.05
Control	30.3	1.34	31.3	2.39	NS
Plan and Control	29.8	0.90	28.22	1.49	NS

% Score 3 (severely lame)

Group	Sep to May	+ SEM	Jun to Aug	+ SEM	Sig. Diff.
Plan	5.7*	0.62	4.5**	0.70	NS
Control	8.9*	0.62	9.5**	1.23	NS
Plan and Control	7.3	0.45	6.9	0.75	NS

*There was a significant difference in average score 3 results between Plan and Control farms for September to May at P<0.01.

** There was a significant difference in average score 3 results between Plan and Control farms for June to August at P<0.001.

APPENDIX 11 – First press article to mention the project

RADA News article from December 2012

Footbathing – Why, Who, When, Where, What, and How?

Sara Pedersen, Nantwich Farm Vets

A new research project funded by DEFRA through RDPE is investigating ways of improving cattle mobility on dairy farms. Results from the project will come through in Spring 2013; in the meantime Sara Pedersen of Nantwich Farm Vets focuses our attention on footbathing.

Why should you footbath?
Footbathing remains the key way of both treating and controlling digital dermatitis infections on farm. Digital dermatitis is often described as 'mastitis of the foot' and therefore footbathing can be considered as the equivalent to teat dipping in mastitis control. In addition it can help harden the hoof and make it less susceptible to penetrating injuries or shearing forces.

Who should you footbath and when?
Selecting which cows to footbath and when is also crucial since dry cows and youngstock are often left out of treatment regimes. However, it is important to treat all at risk animals – even the bull! Although the frequency of footbathing needed to keep infection under control will vary from farm to farm, commonly it is the case that the more frequent the better. On farms where infection levels of digital dermatitis are high, daily footbathing is advisable.

Where should you place the footbath and how should you design it?
Footbath design is crucial to making the process easy for both you, the cows and, more importantly, ensuring that you get the most out of your product. A footbath is most effective when incorporated into the cow's normal daily routine, hence on the exit of the parlour is a popular place. The more accustomed the cows are to passing through it, the less disruption there will be to cow flow and the less contaminated the footbath will become.

There has been a lot of debate about whether a prewash bath is necessary or not. The most recent advice is to avoid the use of two baths unless there is a gap of more than 2.5-3 metres before the treatment bath to ensure that it stays clean. If a pre-wash bath is used then it should contain the treatment solution at a lower

concentration rather than water e.g. 2.5% copper sulphate in the pre-wash and 5% in the treatment bath.

In terms of construction, a 'built in' concrete footbath (Photo 1) is more comfortable for the cows and will not move when they pass through it. Comfort can also be improved with a rubber lining. Good cow flow is important as it helps to reduce faecal contamination and displacement of the footbath contents. Although very popular, rigid plastic baths with pronounced ridges on the bottom are uncomfortable and are not recommended.

As well as considering cow flow when designing your footbath it is important to pay attention to its position and how easy it is to fill, empty and clean out. The easier it is to maintain, the more frequently you are likely to use it.

Length, width and depth of the bath are also critical. Ideally cows should place each foot in the solution at least twice and not be able to 'jump' the bath, therefore a length of at least 3 metres is required. It should also be wide enough to ensure that cows are not able to straddle it or walk with one foot in and one foot out of the bath. A wider bath that allows two cows to pass through side by side also encourages cow flow (Photo 2). To ensure feet are completely immersed in the footbath solution it must be deep enough to allow it to be filled to a depth of around10cm.

What should you use?
Despite the widespread practice of footbathing and its importance in lameness control, there are relatively few studies on the effectiveness of the various agents that can be added to the bath. When deciding what to use the following should be considered: ease of use, disposal, cost and, most importantly, does it work?! It is a common belief that footbathing agents act as 'treatments'. However, in reality the majority are disinfectants and therefore have a preventative action, much like teat dipping in mastitis control.

Whilst there may be a number of different agents to choose from, it is important to remember that they are unlikely to work if they can't get to the target area. The full potential of the agent will not be achieved if the cows' feet are dirty on entry or do not receive sufficient numbers of 'dunks' in the bath. Tables One and Two provide information of the properties of the most popular footbathing agents and the components of commercially available products.

Accurate measurements of the footbath must be taken to determine its volume when full so that sufficient agent is added to achieve the desired concentration. As a general rule of thumb the footbath should contain one litre for every cow that passes through it i.e. a 200 litre footbath must be changed every 200 cows otherwise it becomes ineffective and can actually spread rather than prevent infection.

With digital dermatitis now being implicated in non-healing hoof lesions its control is becoming even more important. So next time you are footbathing your cows consider the six golden rules and whether you are getting the most from your footbath.

The 6 golden rules of footbathing:

1. Feet must be clean on entry
2. Good cowflow through the bath
3. Use an effective chemical
4. Use correct concentration – measure!
5. No more than 1 cow passage for every litre of footbath
6. Footbath regularly

Table 1: Comparison of actions of different agents

Agent	Cure Rate	Disinfection	Cleaning	Hardens claws or skin
Antibiotics	+++	+++	+	-
Formalin 5%	++	+++	+	+++
Copper sulphate 5%	++	+++	+	-
Zinc sulphate	++	+++	+	-
Hypocholorite 1%	+	+++	+++	-
Organic acids	+	+++	+/++	-

Table 2: Summary of active ingredients in commercially available footbathing products.

Product	Manufacturer	Active Ingredients
Bootmaker	Genus	Gluteraldehyde, quaternary ammonium chloride
Deosan Hoofcare Plus	Deosan	Gluteraldehyde, quaternary ammonium chloride
Healthy Hooves	Healthy Hooves Europe	Organic acids
Intra-care Hoof-fit	Quill Productions	Copper sulphate, zinc sulphate, organic acids
KlingonBlue	Forum Animal Health	Copper sulphate, zinc sulphate, organic acids and 'sticking' agent
Kovex foam	Genus	Organic acids
Hoofsure Endurance	Provita Animal Health	Organic acids, tea-oil and wetting agents
Superhoof Plus	Kilco	Organic acids, zinc sulphate and eucalyptus oil

Photo1: A built in concrete footbath is more comfortable for the cows to walk through and less disruptive to cow flow.

Photo 2: Double width footbaths can aid cowflow

APPENDIX 12 – Draft second article, communicating welfare issues/results from the project.

Understand it to beat it: reducing dairy cow lameness

Some dairy farms have no or very few lame cows; others have up to 60% of the herd lame at any one time. Why the difference? You might think it is down to the breed of cow, the trimming policy, the type of system, or how often foot bathing is done. Not necessarily, according to results from a large scale mobility project, conducted in partnership with RADA here in the North West.

Three key qualities appear to be the keys to good mobility on any dairy farm: awareness, understanding and attitude.

<u>The Project</u>

The launch of the DairyCo Healthy Feet Programme (DHFP) in 2011 means that the GB dairy industry now has a national lameness control programme, which is focussed on prevention, not just cure.

RADA led an 18 month research project, funded by DEFRA, on cattle mobility in North West England. The project was overseen by a steering group consisting of NFU representation, as well as other farmer members, and had three objectives:

- To measure the impact of the DHFP on mobility in dairy cattle.
- To understand the motivations and barriers to implementing management changes on-farm that improve cattle mobility.
- To evaluate the cost savings and business benefits arising from mobility improvement.

The study involved 11,800 cows on 44 dairy farms: half had voluntarily enrolled on the DHFP, and the other half were recruited to act as random "control" farms. The term "control" means a group of individuals who represent the normal population, against whom a study group can be compared. The aim was to test if those farms on the DHFP did anything differently, or reduced their lameness more than the controls. All farms had independent, regular whole herd mobility scores done over a 12 month period, and farmers were interviewed in depth at the end of the year to find out what they thought about lameness and what they did for prevention.

At the end of the study, it was possible to look at the differences between:

1. Farms enrolled on the DCHP and those not (the "controls").
2. Farms which reduced lameness the most over the year and those where lameness increased the most.
3. Farms with the least lameness and those with the highest proportion of lame cows in their herds.

A few words about mobility scoring

The DairyCo Mobility Scoring system (0,1,2 and 3) was used during the project. Scores 2 and 3 are classed as "lame", 0 and 1 as "not lame". Great care was taken that all scorers were trained to a consistent level. In addition, the same person scored any individual farm at each occasion through the year, wherever possible.

Never the less, mobility scoring is subjective, as it involves humans, and it could be biased as well as prone to error. Previous studies have found that scoring is reasonably reliable, but herds with more lame cows tend to have lame cows missed (so they get a better overall herd score than the reality), whereas in herds with very few lame cows, it is easier to identify a greater proportion of them (so their herd score is more accurate).

The last previous large scale UK project involving mobility scoring found that 36.8% of cows were lame (score 2 or 3) at any one occasion. This was done in 2006/7, by Bristol University, mainly in south west England.

Farmers who have never had their herds independently mobility scored before are sometimes surprised at their herd results. Another study looking into this found that farms might often be aware of the very lame cows (score 3's) but less so of the mildly lame cows (score 2's). However, once these cows are identified for them, they are very good at pin-pointing which foot the cow is lame on, meaning they do have a good ability to identify them as lame, but somehow don't see them or count them at this level of lameness.

One of the biggest benefits of regularly scoring properly is finding those early lame cows so they can be treated promptly. This makes recovery quicker, the impact of the lameness less damaging, and the job for the farmer or trimmer much easier. One of the key assets of the DairyCo Healthy Feet Programme identified by about half of the enrolled farmers was that they learned to use regular mobility scoring to identify and treat lame cows earlier than they were doing before.

Results

Overall, at the start of the project, 32% of cows were lame (score 2 or 3 using the DairyCo mobility score system). There were no overall differences between the "DCHP farms" and the "control farms", but within all farms there was a very wide range: from 0% lame to over 50% lame.

After a year, the DCHP farms showed a significant reduction in lameness overall: down to an average of 25%. Again, there was a big range, with some farms showing better improvement than others.

Within the "control" group, the overall lameness remained the same, at 32%. Some farms had improved, and some farms had worsened, but generally there was less movement in mobility scores than in the DCHP group.

Overall, there was no significant *seasonal* variation in lameness, though all herds fluctuated to some degree in mobility scores between each occasion (scores were done every 3 months).

The DCHP farms did twice as many new actions during the year as the "control" farms to reduce lameness (7.9 vs 3.8). However, the study did not find any isolated actions or management practices which were common to all farms with lowest lameness, or which lowered lameness the most.

Table 1: Mobility scores during the project

	% herd score 2	**% herd score 3**	**% herd lame**
Average of all farms at start	23.8	8.2	32.0
Control farms at start	21.9	10.1	32.0
DCHP farms at start	24.5	7.4	31.9
Control farms at end	21.7	10.3	32.0
DCHP farms at end	20.7	4.7	25.4
Top 25% herds (lowest lameness average over year)	13.4	3.5	16.9
Worst 25% herds (highest lameness average over the year)	27.1	13.7	40.8
Average of farmers' estimates for own farm	-	-	22.9
Average of farmers' estimates for the average of UK dairy herd	-	-	30.2
Average of farmers' own aspiration for whole of UK dairy herd	-	-	10.3

Looking at the bottom three rows in Table 1, it is interesting to see that farmers have a pretty realistic view of lameness in the UK dairy herd (an average estimate of 30.2%), and an aspiration to reduce this significantly (to around 10%, on average). However, farmers do tend to under-estimate lameness on their own farms.

Awareness, Understanding and Attitude

Something which was striking was that farmers with lowest lameness were better able to accurately estimate lameness in their own herds. Meanwhile, farms with higher lameness levels consistently under-estimated their herds' lameness levels by

much greater amounts. The DCHP farms, by the end of the year, significantly improved their ability to estimate their herds' lameness levels, indicating that awareness improved.

Farmers were set a short quiz on their ability to recognise and understand the causes of some common foot disorders. Again, the DCHP farmers significantly improved their understanding from the start of the year to the end. It was difficult to measure whether increased understanding of lameness led to less lameness directly, but those farms which showed the biggest lameness reductions during the year also scored higher in the same quiz. These farmers were also more likely to have had recent formal training in foot care/ trimming, either for themselves or their staff.

Perhaps the most interesting difference between the farms with lowest lameness and those with the most was in their attitude to lameness, and confidence in their ability make a difference. Farmers with least lameness rated having an action plan to reduce lameness more highly. Most farmers, whether DCHP or "control" farm, identified lack of time and lack of money as significant barriers to reducing lameness, but the DCHP farms valued having an action plan with external help which enabled them to identify the easiest and cheapest things they could do which were likely to have the greatest impact on reducing their herds' lameness.

The following diagram summarises the apparent progression of farmers from those with highest lameness levels to those with the lowest lameness:
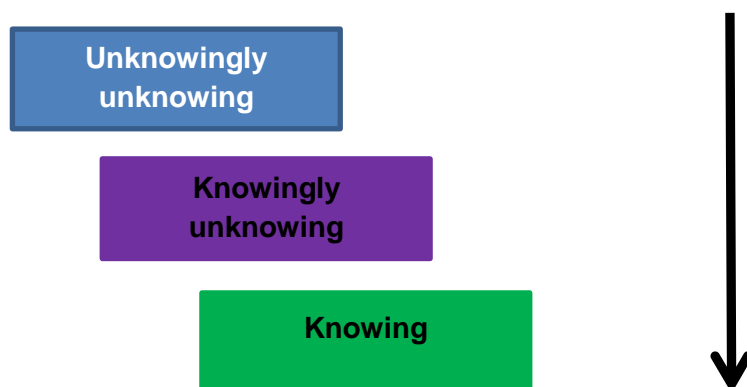
The "unknowingly unknowing" farmers would appear to have the most lameness, have the poorest ability to estimate their herds' lameness levels, and the least understanding of lameness. However, they do not recognise this as a factor in their ability to prevent lameness, instead having a greater tendency to blame external factors for their cows being lame (from "poor tracks", to "the weather" to "genetics" to "not enough money"). They over-estimate their own understanding of lameness.

The "knowingly unknowing" farmers have their awareness improved so that they are better able to recognise that they may require, for example, external help. They begin to place value on better knowledge/ training/ information on lameness, and can better estimate the lameness levels in their herd. They begin to take control of their own herds' lameness and are more likely to identify things they can do to reduce lameness.

The "knowing" farmers have the best understanding of lameness in their herds. They have an action plan and are measuring and monitoring their progress closely. They are less likely to identify barriers to reduce lameness as things out of their own control and show the greatest motivation to reduce lameness. These farms have the least lameness - and will be consequently much more profitable.

<u>Health and welfare aspects of lameness</u>

When interviewed, it was almost universal that farmers in the study felt lameness was "very important" for the British dairy industry. The top three reasons for this were public perception (of British dairy farms), reduced production, and concern for the health and welfare of cows.

Even so, the study showed that farmers consistently under-estimated to what extent lameness affects cows' health and welfare. Part of the reason for this is perhaps that lame cows hide their lameness very well: an essential aspect of their evolution. To avoid attack by predators, a cow has evolved to always stay with the herd, preferably hiding somewhere in the middle, to remain alert at all times, and, most importantly, not to show signs of weakness and to be able to run as fast as her herd mates.

Mobility score 3 cows, by definition, can not keep up with their herd mates. In Darwinian "survival of the fittest" terms, they would be the lions' breakfast or the jackals' supper. In terms of what farmers see, this 5-10% of the herd are the ones which they notice. But what of the other lame cows? The mobility score 2 cows are lame: you can spot them if you try, but they have not yet lost their ability to stay "hidden". They have lesions though: you will find something if you lift their feet. They will also be feeling pain. Importantly, they will also be having knock-on consequences to their ability to function well.

Lame cows, even these "hidden" ones, have altered feeding behaviour. In housed herds, they get up to feed less often, so their meals are larger and more prone to inducing rumen acidosis. In both grazing and housed herds, their total dry matter intakes are less - so they produce less milk. They "milk off their backs" and lose weight.

The weight loss means they are less fertile too. This, and the fact they want to "hide" means that they come into heat less strongly (if they are cycling at all) and they take a significantly longer time to conceive and have a higher chance of being culled as barren. One recent UK study showed that lame cows, even if for a short period of time, took on average over 60 days longer to get in calf than their herd mates who never went lame.

Lameness, in its own right, is a significant reason for premature culling. For some herds, culling due to lameness can account for over 10% of the milking herd per year. These cows usually have a higher economic loss associated with them than other forced culls (eg due to infertility, or mastitis) because they have the lowest "trade in" value. For some farmers, it is only these very lame cows which they attribute losses to, but in reality, they are only the very tip of the ice-berg.

Summary:

The project has been vital in understanding more about reducing lameness. It has shown that the DairyCo Healthy Feet Programme can significantly help individual farms reduce their herd lameness levels. However, it is also apparent that no single factor will be the answer for all farms, and that a tailored approach is needed.

The unifying factors which farmers with low lameness have in common is an increased awareness of their own herd's mobility status, and a more positive attitude to reducing lameness. They understand lameness better are more likely to have an action plan.

APPENDIX 13 – Draft third article, communication economic impact of lameness results from the project.

WHAT IS LAMENESS COSTING YOU?

A recent study of lameness in dairy cows and the views of farmers in the North West, found that farmers were very good at knowing why poor feet cost them money, but not exactly how much. George Fisher Reports.

It seems to be easier to identify why lameness costs a farming business money, but not so easy to predict how much. Hardly surprising when the consequences of lameness are so wide and interrelated – reduced fertility, less feed intake, lower milk production to name just three. But does this mean that farmers don't realise how much costs can be reduced by tackling the problem?

The study

The most recent study on lameness in dairy cows has recently been completed and some of the findings make for sober reading. Funded by DEFRA and run out of Reaseheath College in Cheshire, the work tracked lameness on two sets of farms. One group of 24 (the PLAN FARMERS) implemented the DairyCo Healthy Feet Programme on their farms for a year in 2012/13. The programme involves a co-operation between the farm and its vet in assessing lameness, providing training and coming up with a prioritised action plan to improve the situation on that specific farm.

The other group of 21 (the CONTROL FARMS) did not have the Healthy Feet Programme, but over the same time period, all farms were mobility scored to discover the prevalence of lameness. As reported previously in RADA news, the five mobility scores on all the farms over the year showed that lameness on Plan Farms was reduced by 20% from an average of 32% lame to 25% lame; lameness on the Control Farms stayed at 32%.

All the farmers (or herd managers) were also interviewed so that they could give their views on lameness, reveal what they know about the subject and tell the project team what motivations and barriers they experience in tackling mobility issues on their farms.

Calculating costs

With all the interrelated impacts of lameness, it's difficult to calculate the costs on any particular farm, but there is an industry standard which was used by the project team. It starts with the level of lameness on farm and this was measured using the DairyCo (0, 1, 2, 3) Mobility Scoring system, where 0 = not lame, 3 = severely lame.

- The average cost of an incidence of lameness (scores 2 and 3) is £330 per case. This includes:
    - Treatment costs

- - Lost revenue from reduction in milk yield
  - Culling
  - Reduction in cow fertility
- This average cost of incidence recognises that the above factors result in a per case cost by type of lameness as follows:
  - Digital dermatitis - £100
  - White Line disease – £250
  - Sole Ulcer - £550
- The mobility score provides a snapshot measurement of the prevalence of lameness in a herd. The prevalence multiplied by 2.5 provides a model of incidence in a herd over a 12 month period.
- For example, in a 100 cow herd, a MS showing a prevalence of 40% cows at scores 2 and 3 indicates an incidence of 40 x 2.5 = 100 cows per year. At £30 per case, this equates to a cost of £33,000 (£330 x 100).

The study farms

It's interesting to see the range of farms that engaged with this research (see the purple table). The range was wide and the average study farm was larger and had a higher milk output than the national GB average.

Study farm details

	PLAN FARMS	CONTROL FARMS
Cow numbers (average)	295	240
Cow numbers (range)	72 to 550	90 to 540
Yield (litres per cow average)	8,863	7,917
Yield (litres per cow range)	5,000 to 11,000	6,500 to 9,400
Number of AYR systems	23	17
Number of block calving systems	1	4

One interesting commonality amongst both Plan and Control farms was that many felt that the costs of lameness were significant, but 'not as high as my vet says!' So, who was right…?

The costs

Using the standard industry calculation, the actual costs calculated for the study farms are shown on the blue.

Calculated costs of lameness on study farms

	Plan Farms at start of study	Plan Farms at end of study	Control Farms at start of study	Control Farms at end of study	Top 25% at start of study	Top 25% at end of study	Bottom 25% at start of study	Bottom 25% at end of study
% lameness	32	25	32	32	38	18	30	40
Cost per 100 cows (£ per year)	26,400	20,625	26,400	26,400	31,350	14,850	24,750	33,000

Being on the Healthy Feet Programme reduced the annual cost of lameness on average by almost £4,000 per farm, while those not on the programme saw no reduction in costs. Even more striking, for the 10 farms in the study that reduced lameness the most (the 'top' 25%), their costs associated with lameness reduced by £16,500 per farm; for the 'bottom' 25% where lameness increased the most, costs went up by £8,250.
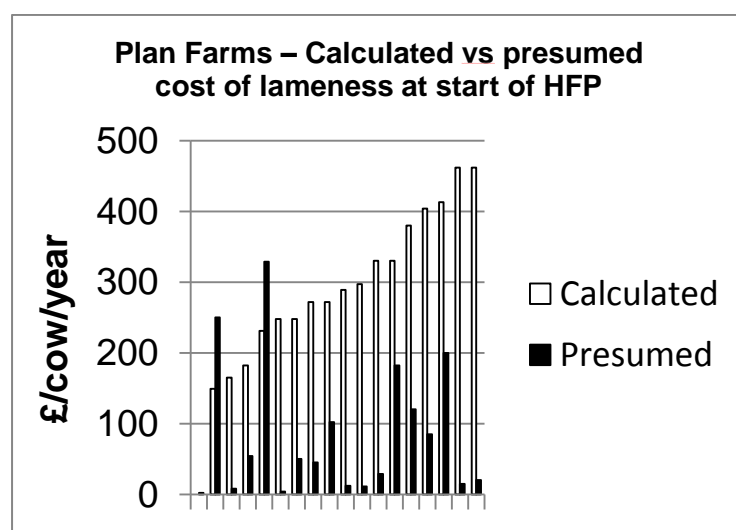
Farmers know where the costs come from…

Went it came to scoring where the costs come from, the farmers in the study, regardless of their being Plan or Control Farms, all knew where the major and more minor costs lie. When asked to rank different elements to the 'cost' of lameness, the study farms all came up with pretty much the same order (see red table).
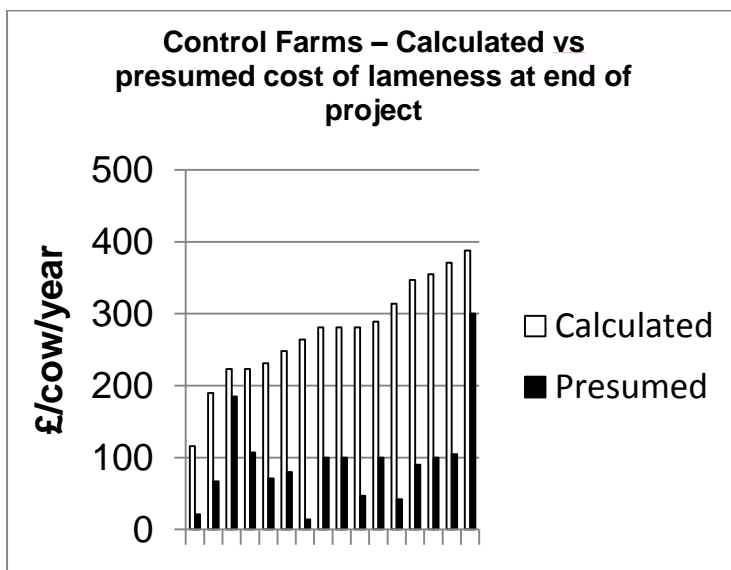
Ranking the factors that influence the cost of lameness (1 = least important, 5 = most important)

Factor	Plan Farms	Control Farms
	Average ranking	Average ranking
Infertility	3.8	3.9
Milk loss	3.7	3.6
Culls	3.5	3.7
Treatment	2.2	2.2
Time and labour	2.1	2.4
Loss of cow condition	2.0	2.2
Foot trimming	1.7	1.8
Footbathing	1.0	1.3

…but can't predict what they are.

Even though the study farm knew where the costs came from, they were pretty poor at predicting or knowing what those costs were on their own farms.

Plan Farms – Calculated vs presumed cost of lameness at end of HFP

Control Farms – Calculated vs presumed cost of lameness at end of project
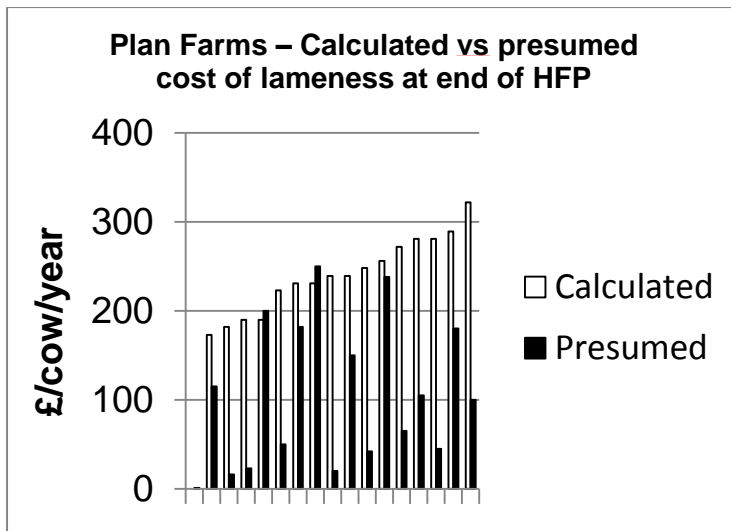
Both the Plan and Control farmers were, on average, out by a factor of about 3 – so if the calculated costs were £300 per cow per year, the presumed costs on farm were stated as £100. Even after being on the Healthy Feet Programme for a year, the Plan Farms were still out by a factor of 2 (they thought the actual costs were a half of what they were).

What are the costs on your farm?

There's no point in teaching Granny to suck eggs, but if you know your rate of lameness from a mobility score, you can work it out for yourself. % lame x 2.5 x£330 = cost per 100 cows.

The next question is, if you knew what your lameness costs were by this accepted industry standard, would that knowledge stimulate you to take more actions improve cow mobility? Cost was a motivating factor in this research study, but obviously not the only one. Farmers are also concerned about and motivated by the animals in

their care, public perception and image and the morale of themselves and their employees.

Do we have the calculations or communication wrong?

There is obviously a gap between what the industry consensus is on the costs of lameness and what farmers perceive them to be. Perhaps it's more to do with how the 'industry' communicates its understanding of costs. Vet Owen Atkinson, who was involved in this study, thinks that we may need to change how we think about these costs.

"It is apparent that farmers have great difficulty estimating the economic effects of lameness," Owen says. "Understanding and knowing the economic costs of lameness could be a valuable motivating factor for farmers to take action to reduce the problem. Currently, this economic motivation is not being harnessed to any effect."

Owen proposes that we might start to think about these costs the same way as we think about the cost of fertility. "Farmers are familiar with a cost per day basis for poor fertility; a major production 'disease' which has hidden costs, just like lameness. Typically, farmers use a figure of £2.50-£3.50 per day for each day extended calving interval, and accept this as credible."

Owen goes on to make a proposal. "A model could be constructed, using best evidence available which is UK specific, on the economic effects of lameness *per day.* The model should have recognition of the fact that a severely lame cow is more costly than a mildly lame cow." He continues, "The main economic effects will be reduced fertility, reduced production (yield and possibly quality), reduced chance of a forced cull, reduced cull value, and treatment costs."

Tell us what you think!

So, is Owen right; do we need to change the way we think about the 'hidden' costs of lameness to a per cow per day basis? Would that help motivate you to take even more actions to control lameness? Would this be good enough to convince you that investing in lameness control has a sufficient payback for your business?

We would be very pleased to hear your views. You can give your opinion by contacting George Fisher on….

APPENDIX 14 - Owen Atkinson: Key learnings and comparison with Tubney Project.

1: Epidemiology of lameness

- The raw mobility score data give valuable current insights into the levels of lameness in dairy herds, in terms of averages, ranges and seasonality.
- Previous studies on this sort of scale, spanning cows from so many herds are rare worldwide, let alone in the UK. The last large scale prevalence study in the UK was by Zoe Barker (1), conducted as part of her PhD at Bristol University, during 2006-7. It is quoted by CHAWG (the Cattle Health and Welfare Group) - a national cattle industry review and steering group - in their last published report in September 2012 (2).
- This study showed a slightly lower prevalence than the Barker study, but is broadly similar. An important difference between the two studies is that this study is longitudinal: i.e. measuring prevalence over the period of a year, at set time points. Barker's study, though involving more farms (n=205), measured prevalence at only a single time point for each farm.
- The longitudinal nature of this study demonstrates that lameness prevalence fluctuates throughout the year on most farms (largest fluctuation was ..... to ....). This fluctuation was also seen in the prevalence of severely lame (score 3 cows). However, taken as a whole population, the study did not show any significant effects of season on prevalence.
- Despite this longitudinal fluctuation, it is apparent from the study that there is a large "farm effect" on lameness prevalence. Put simply, the risk of a cow being lame or not-lame would appear to be very dependent on which farm she is kept. The wide range of lameness prevalence echoes Barkers study (where the range was 0% to 79.2%), and demonstrates that some farms can successfully manage their cows to maintain minimal lameness in their herds.
- The number of farms involved in the study does not give sufficient statistical power to determine if specific farm types, or specific individual management practices, are associated with a greater or lesser lameness prevalence. However, there is some indication that farms operating a block calving grazing system have a lower lameness prevalence. These farms are also lower yielding, and have less predominance of Holstein genetics. Of the remaining farms, no single factor, including yield or herd size, seemed to stand out as giving a higher or lower risk of lameness.

2: Farmer attitudes and beliefs regarding lameness

- It was useful to establish farmers' perceptions and aspirations with regards lameness in the UK dairy herd. Questions 1.1 to 1.9 indicate that farmers do indeed recognise lameness as being a very important disease in the UK, and demonstrate a desire to reduce it significantly (Q 1.8 and Q 1.9).
- Farmers recognise that mobility is an extremely important aspect of animal health on their farm (Q3.3) and list several factors as to why this should be so (Q 3.4). The five most important reasons given were:
  1. Reduced fertility
  2. Pain and suffering for the cow
  3. reduced profits
  4. poor public image of dairy farming
  5. reduced morale
- Farmers underestimate lameness in their own herds (Q 2.13), but less so in the national herd (Q 1.8).

- There were no significant differences found between the control farms and those which decided to enroll on the DCHP with regards perception of lameness within their own herds (Q 2.13). This answered the important question of whether DCHP farms would have a better appreciation of lameness beforehand, which might in fact have stimulated them to enroll in the DCHP.
- The nature of the study did not allow in depth analysis of changes in *attitudes* to lameness as a *direct result* of the DCHP, as the main questionnaire was completed at the end of the study period only.
- Farmers rate their understanding of lameness highly (Q 2.1). Lack of training, knowledge or understanding of what measures to take (to reduce lameness) was rarely cited as a reason for not being able to improve mobility on their farms (Q 4.1, 4.2 and 4.3). However, the lesion quiz scores (Q 2.12) suggest that prior to the DCHP, farmers understanding of lesions is poor. The answers to Q 2.18 also point to a distinctly narrow appreciation of lameness intervention measures amongst farmers who had not benefitted from the DCHP. Quick intervention of mildly lame cows, mobility scoring (to detect early cases), improved cattle handling (good cow flow) and increasing cow comfort (lying times) are all known important factors in reducing lameness, but farmers show very low awareness of these (Q 2.17, 2.18). In this way, the study points to a widespread "unknowingly unknowing" state amongst dairy farmers, when it comes to mobility.

3: Effect on lameness prevalence of the DCHP as an intervention

- Intervention studies on lameness are very rare. The DCHP is a new "product" and has never previously been tested as an intervention in controlled conditions .
- A previous UK study (Barker et al, 2012) (3) demonstrated no effect of veterinary intervention and advice on prevalence of specific lameness diseases, but it was noted the difficulty of conducting this type of research: specifically due to accuracy of lesion recording, measuring the compliance of advice and the time involved for actions taken on farm to translate into reductions in lameness incidences. This study did not attempt to record specific lameness incidents, or to measure the types of lameness, relying instead on herd mobility scores (prevalence data) recorded longitudinally.
- This study did find a significant difference between DCHP farms and the control group, giving confidence that the DCHP, as a specific single intervention, reduces lameness, in the timespan of the study (12 months). However, the DCHP is a complex intervention and is by its nature not standardised between farms (as it involves a farm-specific action plan). Not surprisingly, therefore, there is a varied effect of the DCHP and it did not result in reduced lameness for all farms which undertook the intervention.
- The study did not attempt to measure compliance with the advice given in the DCHP (although all DCHP farms did complete the DCHP once enrolled, so in one sense, a 100% compliance rate).
- The longer term effects of the DCHP have also not been tested, as the project was able to monitor farms for only one year (although a slightly extended period of testing is underway). Anecdotal evidence suggests that, just as in Barker's 2012 study, there could be some significant time lag before actions are taken on farm, following the inception of the DCHP, and presumably further delays before the effects of those interventions can be detected by herd mobility scores. Conversely, the increased motivation to improve mobility generated by the DCHP could wane over time, and the beneficial effects may not be sustained.

4: Effect on farmer behaviours, attitudes, understanding and actions of the DCHP

- The end and start questionnaires determined some interesting effects of the DCHP on the farmers, notwithstanding any effects on herd level lameness. These are summarised below:

  1. they increased their knowledge (scored higher on the lesion quiz) (Q2.12)
  2. they had increased awareness of lameness in their herds (were more accurately able to estimate their herd mobility scores) (Q 2.13)
  3. they put in place twice the number of actions to reduce lameness than control farms (average of 7.9 vs 3.8) (Q 2.19)
  4. they improved their confidence of knowing what to do to reduce lameness (Q 4.2 and 4.4: consistently lower "barrier" scores)

- It was interesting to note the top actions taken by the DCHP farms. In addition to "having a mobility improvement plan", which was an answer given by 100% of DCHP farms (and 0% of control farms), the following measures were identified as having been taken by at least **40%** of DCHP farms (Q 2.19):

  1. mobility scoring to identify early cases
  2. having foot trimming training
  3. cubicle modifications and improved lying comfort
  4. repairs to concrete surfaces/ grooving
  5. improved foot bathing procedure
  6. improved stock person behaviour, reducing stress on cows' feet

     (NB: In the case of all of the above answers, they were given noticeably   more frequer

- It was also valuable to learn what benefits the farmers themselves perceived from their involvement with the DCHP. In descending order of frequency, the following aspects were mentioned by at least **25%** of DCHP farms, in an **open question** with no prompts (Q 5.1.2):

  1. access to better knowledge/ training/ information on lameness
  2. providing a focus to reduce lameness
  3. input from the vet (mobility mentor)
  4. the structure of the programme
  5. mobility scoring
  6. working as a team

- Learning from the DCHP farmers what could be further improved (with the DCHP), the following was identified as possible areas of development (Q 5.2):

  1. a fresh whole farm assessment by the mobility mentor every year
  2. better information on the costs of lameness
  3. more information sharing between farms

5: Learning from those farms with the lowest lameness prevalence and those which improved the most over the year:

- The limited number of farms involved makes further analysis of trends difficult from a statistical perspective. However, some trends were indicated by grouping the questionnaire answers into the top quartile and bottom quartile for farms depending both on lameness prevalence (average over the year), and most and least improvement (from the start to the end of the study period). It should be noted that these observations are derived from a somewhat subjective review of questionnaire answers.

Farms which had the **lowest lameness levels**:

- were more likely to identify lameness as a problem reducing production (Q1.2)
- gave more accurate predictions of their own herd's lameness level (Q 2.13)
- were more likely to be a block calving grazing herd
- rated having an action plan to reduce lameness more highly (Q 2.21)
- were less likely to dislike dealing with lame cows (Q 3.5)
- were more likely to do a scheduled foot check at some point during lactation (as well as at drying off) (Q 2.5)
- showed more interest in reducing lameness (Q 4.4)

Out of the top 10 farms with lowest lameness, 6 were Plan Farms.

We also looked at those farmers who **decreased** lameness the most over the year, and what marked them out from the farms which increased the most.

Farms which **decreased lameness the most**:

- had more formal training in foot care (Q 2.8)
- scored higher in the lesion understanding quiz (Q 2.12)
- could think of more factors which influence lameness (Q 2.18)
- were more likely to do a scheduled foot check at some point during lactation (as well as at drying off) (Q 2.5)
- rated having an action plan to reduce lameness more highly (Q 2.21)
- identified less barriers (excuses) not to reduce lameness (Q 4.2, 4.3, 4.4)

Out of the top 10 farms which decreased lameness the most, 6 were Plan Farms. Of the 10 farms where lameness increased the most, 2 were Plan Farms.

6: Economic effects of lameness

- Perhaps one of the most important learnings of this study is with regard to the understanding of economics surrounding lameness.
- 25% of all farms were unable to hazard any guess or estimate of the cost of lameness to their farms (Q 2.15). Of those that did offer a cost, the average under-estimate was 250%, compared with our own estimate calculations.
- No farmer was able to give an answer which logically derived a cost to their business. Although individual farmers were able to identify individual costs associated with lame cows (such as reduced production, or the costs associated with treatment, or the costs associated with increased culling) not a single farmer was aware of the *totality* of economic effects of lameness.
- The economic effects of lame cows are due primarily to reduced production, reduced fertility, increased culling, and treatment costs. Previous work, such as by Wilshire and Bell (2009) (4), base cost estimates on single lesion incidences. Accurate lesion incidence data is rarely available.
- A simple cost estimate system is needed for the industry, preferably calculated from prevalence data (which is more readily available).
- Economic efficiency is a potentially large motivating factor for farmers to reduce lameness. Previous studies (5) have found that farmers do not rate this factor less significantly than "softer" motivations, such as having better pride in the herd. Whilst recognising these motivations as important too, it is entirely feasible that farmers do not rate economic effects highly enough, because they simply do not have a good enough handle on them.

References:

(1) Assessment of lameness prevalence and associated risk factors in dairy herds in England and Wales
Z. E. Barker,1 K. A. Leach, H. R. Whay, N. J. Bell, and D. C. J. Main
J. Dairy Sci. 93:932–941; 2010
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   (3) Uptake and effectiveness of interventions to reduce claw lesions in 40 dairy herds in the UK; Animal Welfare 2012, 21: 563-576. Barker, Wright, Blowey, Amory and Green
   (4) http://www.bcva.eu/bcva/education/documents/economic-review-cattle-lameness
   (5) Working towards a reduction in cattle lameness: 2. Understanding dairy farmers' motivations. Leach KA, Whay HR, Maggs CM, Barker ZE, Paul ES, Bell AK, Main DC.
     Res Vet Sci Oct 2010 http://www.ncbi.nlm.nih.gov/pubmed/20413137

APPENDIX 15 – Post project mobility scores

Twenty of the 24 Plan Farms and 12 of the 21 Control Farms agreed to take part in these. Details are in section 3.4 above. The data for start and end mobility scores were reanalysed for these farms only and compared with the post-project scores:

Analyses of start, end and post-project mobility scores for the Plan and Control Farms that took part in the post-project scoring opportunity.

Lameness prevalence (score 2 + 3 %)	Start of project		End of project		Post project	
	Plan (n=20)	Control (n=12)	Plan	Control	Plan	Control
Average	30.1	31.1	26.4	30.3	23.7	29.3
+ SEM	2.58	3.59	2.57	3.91	2.31	4.30
SD	11.53	12.44	11.46	13.55	10.33	14.90
P value	P<0.813		P<0.367		P<0.223	

Lameness prevalence (score 3 %)	Start of project		End of project		Post project	
	Plan (n=20)	Control (n=12)	Plan	Control	Plan	Control
Average	5.5	9.0	5.0	10.5	4.3	8.8
+ SEM	0.85	1.86	1.11	2.41	1.01	3.19
SD	3.82	6.45	4.96	8.35	4.51	11.04
P value	P<0.026		P<0.012		P<0.054	