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ORIGINAL RESEARCH

Exploring farmers' understanding of and responses to endemic animal health and welfare issues in the UK

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Abstract

Background: This paper uses two endemic health conditions to explore farmer understandings of and responses to livestock health and welfare issues.

Methods: The findings are based on a survey of 42 livestock farmers in the north of England, exploring how they manage lameness in sheep and cattle and bovine viral diarrhoea in cattle. We identify similarities and differences in their approaches.

Results: Two themes emerge. (1) The importance of difference between animal types (i.e., beef cattle, dairy cattle and sheep), which highlights the 'complex' and 'multifactorial' nature of animal health and welfare. It is necessary to unpack this to understand the interplay of animal, resource and management issues in farmer responses. (2) Previous research has identified 'lack of knowledge' as a key welfare issue. Our findings reveal farmers are in fact seeking, acquiring and sharing knowledge on practices related to the management of animal health however individual circumstance and context influence how this translates in practice.

Conclusion: Our research highlights the importance of integrating different perspectives and knowledges as a way of understanding and responding to animal health and welfare concerns. Facilitating knowledge exchange both within and between different groups and sectors is vital in achieving this.

INTRODUCTION

Farm animal health and welfare have emerged as priority issues in debates and discussions underpinning the future of agricultural policy in the UK. With the integration of health and welfare enhancements into wider public goods delivery plans confirmed,[1] understanding the nature of animal health and welfare concerns and how resources should be prioritised is critical. In this journal, Rioja-Lang et al.[2,3] reported on a Delphi survey of 'experts' with whom they undertook a prioritisation exercise of welfare issues in farmed and companion animals in the UK. Their paper highlighted the most commonly prioritised concerns across farmed and companion animal species. These included: pain identification and management; shortages of well-trained and knowledgeable staff; health issues; access to appropriate veterinary care; delayed euthanasia and methods used for killing. A key strength of that paper is that it presents clearly the view of a particular group of UK experts defined as veterinarians, academics and representatives from the third sector, industry and government. The paper provokes questions for further consideration by vets and other types of advisors around understanding different types of expert and expertise relating to animal health and welfare, and in particular the value of drawing insights from farmers, as the clients of vets, the ultimate caregivers/owners of livestock and critically as active shapers of animal health and welfare. In this paper, we aim to identify and explore the experience and expertise of livestock farmers in relation to animal health and welfare in general, and the management of endemic conditions in particular. The findings are based on the results of a survey of livestock farmers (beef and dairy cattle, and sheep) in the north of England. The paper builds on earlier social science contributions (e.g., Refs. 4 and 5), including those

specifically relating to farmers' perceptions of disease (e.g., Refs. 6 and 7) and endemic health conditions (e.g., Refs. 8–10) and disease management (e.g., Refs. 11, 12 and 10).

Chronic/endemic livestock health issues were identified as one of the 11 areas of concern relevant to both farmed and companion animals and it was noted that 'the health of farmed animals was of particular concern' to the experts in the Delphi survey conducted by Rioja-Lang et al.[2] (p. 4). Lameness was mentioned as a priority issue in sheep and beef cattle and infectious diseases were mentioned as a priority issue in dairy cattle and goats. These issues are also recognised as important in the UK Agriculture Act.[13] Our paper reports on findings conducted as part of a Wellcome Trust-funded research project: Farm-level Interdisciplinary approaches to endemic livestock disease (FIELD). FIELD focuses on two common, contrasting examples of endemic health issues in the UK: bovine viral diarrhoea (BVD) in cattle, and lameness in cattle and sheep. Both are costly, complex health problems, which negatively affect the welfare of animals, reduce the profitability and increase the environmental footprint of agriculture, and can affect the quality of livestock products. BVD can compromise both the reproductive performance and immune systems of infected animals.[14] Around 90% of UK herds have been exposed it, costing the UK cattle sector c£25–£61 m/year.[15] Lameness is thought to affect over 90% of sheep flocks[16] and approximately 30% of UK dairy cattle.[17] Lameness in dairy cows increases veterinary costs, can impair fertility and reduces milk revenues by an annual average of £1573/herd. It costs UK sheep farmers £70–£210 m/year.[18] It is acknowledged in the literature that better ways of understanding and managing endemic health issues are urgently required.[19] By using these two endemic health issues as a lens, we explore the complexities and heterogeneity of farmer experiences and understanding of, and responses to, livestock health and welfare issues.

METHODS

In order to explore how BVD and lameness are managed on farms, a survey was conducted with 42 farmers across the north of England (Northumberland, Cumbria, County Durham and Tyne and Wear). The sample was not intended to be statistically representative of all farms in northern England, but instead to capture the views of a range of farmers across different farming systems. A regional focus was used given the local specificity of disease environments and knowledge practice; however, the findings are likely to be applicable across the UK, with the understanding that different local conditions will always influence outcomes.

The survey was used to capture details of farmers' experiences of and management practices relating to BVD and lameness. Ethical approval was obtained from Newcastle University's Faculty of Science, Agriculture and Engineering Ethics Committee (reference 7362/2018). The survey explored:

- background information about the farm and livestock kept;
- the main disease concerns farmers have and how these have changed over time;
- the sources of information and advice used by farmers to manage disease;
- BVD concerns and management (including testing and vaccination strategies) and;
- lameness concerns and management strategies.

For farmers who only kept sheep, responses to the BVD questions were not required.

The survey contained both open-ended and multiple-choice questions to capture as much information as possible while ensuring that comparisons could be made across farm types. To ensure that a range of farm types were surveyed, a mixture of upland and lowland beef and sheep farms, and a mixture of dairy farms including indoor-only systems and systems including grazing were invited to take part. Given how few indoor-only dairy farms are within this region, fewer of these were recruited.

The surveys were conducted face-to-face by members of the farm business survey (FBS) Unit at Newcastle University on behalf of the FIELD project. The survey was piloted with two farmers (one dairy and one beef and sheep). Several questions were rephrased as a result. FBS staff completed the survey on behalf of the respondents and were encouraged to add annotations to the surveys to capture additional comments. Surveys were completed between March and June 2019 and were returned anonymised with identification numbers by the FBS team. All data were entered into SPSS version 24. Descriptive statistics were used to summarise the data. We made use of responses to open-ended questions and additional annotations to support findings from the quantitative data.

RESULTS AND DISCUSSION

Difference matters – farm, farmer and livestock diversity

An overview of the sample can be found in Table 1. At a fundamental level, farms obviously differ in terms of their geographical characteristics (e.g., in terms of size, location, altitude, terrain, soil and climate types) and the farming systems deployed, and farmers differ significantly (e.g., in terms of their age, experience, training and qualifications, background, motivations and attitudes). Such differences will affect health and welfare outcomes. In this section, however, we restrict our analysis to outline differences specifically relating to the types of animals kept on a farm, supporting our argument that difference in livestock is important in

TABLE 1 Survey sample characteristics ($n = 42$)

Characteristic	Values (percentage)
Age	
20–29 years	1 (2.4)
30–39 years	6 (14.3)
40–49 years	4 (9.5)
50–59 years	19 (45.2)
60–69 years	9 (21.4)
70–79 years	3 (7.1)
Gender	
Male	38 (90.5)
Female	4 (9.5)
Time at current farm	
0–10 years	8 (19.0)
11–20 years	8 (19.0)
21–30 years	9 (21.4)
31–40 years	11 (26.2)
40+ years	5 (11.9)
Farm description[a]	
Lowland	23 (54.8)
Less favoured area	20 (47.6)
Organic	7 (16.7)
Upland	10 (23.8)
Entry level stewardship	16 (38.1)
Hill	5 (11.9)
Higher level stewardship	16 (38.1)
Farming activities[a]	
Sheep enterprise	28 (66.7)
Dairy enterprise	17 (40.5)
Beef enterprise	26 (61.9)
Farm size[b]	
20.1–50 hectares	2 (4.8)
50.1–100 hectares	12 (28.6)
100.1–150 hectares	4 (9.5)
150.1–200 hectares	5 (11.9)
200.1 hectares plus	18 (42.9)

[a]Multiple options could be given.
[b]One participant did not state their farm size.

considerations of how farm animal health and welfare are thought about.

Our survey suggests that farmers treat the health and welfare of different species, types and groupings of livestock in different ways, for example related to their function (e.g., meat or milk) or their age. First, in practice beef cattle, dairy cattle and sheep were all thought about and treated differently, while second, there were also some similarities in how beef and dairy cattle were treated, despite their different functions. Both points are likely to relate to the individual animal's economic value relative to costs of treatment: individual cows, for example, are normally significantly more economically valuable than individual sheep, regardless of whether they are members of dairy or beef herds. Tables 2 and 3 suggest that there are differences between species, and between animals of the same species but with different functions (i.e., beef and dairy cattle), in why farmers would be concerned about disease in their animals. In Table 2, the costs of preventing or managing disease are slightly more important as a concern in relation to sheep and beef cattle than in relation to dairy cattle, for example, whereas the financial losses incurred directly from disease are seen as more important in dairy cattle and sheep than in beef cattle. This is despite evidence showing that in relation to cattle and BVD, for example, there is no consistent difference between the impacts in beef and dairy herds.[20] Obligations to suppliers/assurance schemes were also more of a motivation for dairy cattle compared with sheep and beef cattle, whereas consumer concerns about animal welfare were more prominent concerns in beef cattle and sheep. This was not mentioned as a concern by the dairy farmers surveyed.

Despite some similarities in reasons for being concerned about disease (Table 2), the measures taken to combat these concerns (Table 3) differ between dairy and beef cattle, seen as functionally different livestock groupings, and thus treated differently with regard to BVD. Herd health plans, double fencing and laboratory testing are used much more frequently for dairy than for beef cattle, while quarantining of newly acquired stock is more important for farmers of beef cattle.

In a similar manner, Figure 1 illustrates differences between species, but also differences between beef and dairy cattle, in farmers' responses to being asked how worried they are about lameness on their farms. The distribution indicates that beef cattle are of less concern than dairy cattle in relation to lameness, while there is more similarity of concern in relation to sheep and dairy cattle.

The survey data indicate that differences between species and between animals with different functions are important in farmers' attitudes towards their animals and in their responses to health, disease and welfare issues. While paying attention to diversity makes thinking about and responding to health and welfare issues more difficult, we argue that it is important in planning solutions which are specific to particular farms, farmers and animals.

Knowledges matter – seeking, sharing and evaluating information

A 'lack of knowledge' has been identified as an important welfare issue,[2 and a] need for improved knowledge transfer has been suggested as a method of improving animal welfare outcomes.[2] Here we consider the ways in which farmers seek and share knowledge on livestock health and disease issues, and how this is utilised on farm.

Our findings indicate that although species differences are apparent (e.g., sheep are checked for health and disease issues less frequently and by fewer types of actors than beef and dairy cattle, which may be due to industry norms relating to workload and

TABLE 2 Farmers' reasons for being concerned about disease in different livestock types

	Beef ($n = 26$)	Dairy ($n = 17$)	Sheep ($n = 28$)
Financial losses incurred (e.g., costs incurred from having the disease)	19 (73.1)	15 (88.2)	24 (85.7)
Cost of prevention/management (e.g., vets or vaccination costs)	12 (46.2)	7 (41.2)	15 (53.6)
Time and effort of management	10 (38.5)	5 (29.4)	13 (46.4)
Personal concerns over animal welfare	12 (46.2)	8 (47.1)	14 (50.0)
Obligations to suppliers and/or assurance schemes	0 (0.0)	4 (23.5)	2 (7.1)
Concerns about your own reputation	4 (15.4)	4 (23.5)	6 (21.4)
Concerns about the reputation of the farming industry	2 (7.7)	0 (0.0)	0 (0.0)
Consumer concern about food safety	0 (0.0)	0 (0.0)	0 (0.0)
Consumer concern about animal welfare	4 (15.4)	0 (0.0)	4 (14.3)
Other (e.g., 'no symptoms')	3 (11.5)	5 (29.4)	3 (10.7)
No concerns listed	3 (11.5)	0 (0.0)	1 (3.8)

Values in the table are given as frequency counts and, in brackets, percentages of the total number of responses for each livestock type. Respondents indicated up to three top concerns for each livestock type kept.

TABLE 3 The most frequently used measures to combat BVD in beef and dairy cattle (% of respondents WHO keep each kind of cattle)

	Beef cattle ($n = 26$)	Dairy cattle ($n = 17$)
Vaccination against BVD	80.8	76.5
Developing and maintaining a herd health plan with a vet	57.7	94.1
Purchasing stock of known health status	57.7	58.8
Keeping a closed herd	50.0	64.7
Sending samples to a laboratory for disease testing	3.9	52.9
Keeping records of actions taken to manage BVD	42.3	41.2
Isolation/quarantine of newly acquired stock	42.3	29.4
Use of external assessor (e.g., vet, assurance scheme representative)	26.9	29.4
Culling affected animals	23.1	41.2
Membership of disease control scheme (e.g., BVD Free)	23.1	29.4
Rotational grazing	19.2	29.4
Breeding strategies for resilience/resistance to BVD	15.4	11.8
Use of double fences around neighbouring fields	7.7	29.4

economic viability), in general there are many different individuals responsible for checking the health of livestock (Table 4). Our findings also indicate that all farmers surveyed are actively searching for and sharing information about a range of livestock disease topics (Table 5). Suggesting that poor livestock health and welfare outcomes are simply due to a lack of knowledge may thus be reductive. It risks implying that farmers, and possibly the vets who provide advice to these farmers and treat their animals, are simply

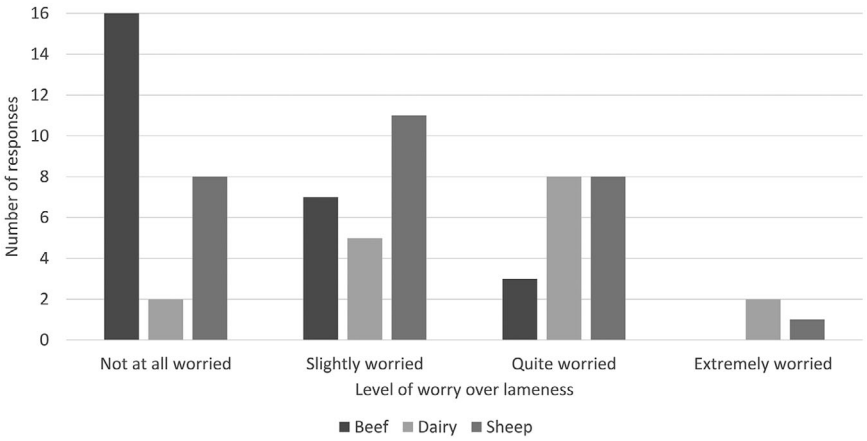

FIGURE 1 How worried farmers are about lameness on their farm ($N = 26$ beef, 17 dairy, 28 sheep)

TABLE 4 Who checks the livestock for health and disease on farms

	Number (percentage)		
	Beef ($n = 26$[a])	**Dairy ($n = 17$)**	**Sheep ($n = 28$)**
The farmer	24 (96)	13 (76)	27 (96)
A vet	15 (60)	12 (71)	15 (54)
A family member	13 (52)	9 (53)	14 (50)
An employee	6 (23)	8 (47)	5 (17)
Other	2 (8)	3 (17)	2 (7)
Another type advisor	0 (0)	3 (17)	0 (0)

Percentages calculated within livestock type kept.
[a]One beef and sheep farmer only completed this for sheep, and one dairy farm with beef grower completed this question for the dairy herd only.

TABLE 5 Who farmers share information with and what kind of information they share ($n = 42$)

	Number (percentage)
Who do you share information with?	
Vets	41 (97.6%)
Family members	25 (59.5%)
Other farmers	19 (45.2%)
Employees	18 (42.9%)
Other advisors	8 (19.1%)
Other	5 (11.9%)
Researchers	5 (11.9%)
Policymakers	1 (2.4%)
No-one	0 (0.0%)
What sort of information do you share?	
Disease prevention strategies	37 (88.1%)
How to treat individual ill animals	36 (85.7%)
How to identify presence of livestock disease	26 (62.0%)
How to manage livestock disease outbreaks	18 (42.9%)
Information on specific disease eradication schemes	18 (42.9%)
The disease status of your own livestock	18 (42.9%)
The disease status of other farmers' livestock	5 (11.9%)
Other	3 (7.1%)

not adopting accepted scientific knowledge and best practice, without taking into account the contingent conditions on individual farms which might mean that 'best practice' is either not possible or might be inappropriate. What 'best practice' is could thus vary between farms.

Our findings indicate that farmers obtain information from multiple sources, with vets a key source (Table 6). These findings build on those of Lowe et al.[21] (p. 36) who note that farmers and vets possess 'vernacular' expertise – '…derived within the locale, through place generated experience and experimentation…' while also drawing upon '… extra local, scientific, professional and regulatory knowledge…' adapted to specific contexts. With different knowledges circulating and mixing, it is not simply a case of 'opening the farmers' eyes' to the correct knowledge, but instead understanding and appreciating how farmers evaluate and operationalise these different knowledges in the context of some of the points outlined in the previous section. Table 6, for example, shows how farmers evaluate the usefulness of the sources they consult.

Farmers listed numerous barriers to the implementation of preferred practices or 'gold standards' of care to manage BVD and lameness. Primary among these were resource constraints (i.e., finances, labour requirements, and time taken). The following comments were noted, in regards to enacting additional practices to manage BVD and lameness respectively:

> [the] time and effort needed to do it. Just a one-man farming operation and it costs time and money to get help and carry out additional work with the cattle (Beef farmer)

> Considered mats for buildings but costly, also time for getting in a regular foot trimmer. Always due to time and money… (Beef and sheep famer)

TABLE 6 Sources of information and the usefulness of these sources

Source of information	Number (percentage) use the source	Usefulness of the source (number of respondents who used the source)		
		High	Medium	Low
Vets	41 (97.6)	36	4	1
Other farmers	16 (38.1)	7	9	0
Farming publications[a]	15 (35.7)	1	11	2
Other	11 (26.2)	5	5	1
Milk recording[a]	10 (23.8)	8	1	0
Feedback from slaughterhouses[b]	10(23.8)	3	4	2
Family members	9 (21.4)	6	2	1
Livestock nutritionists	8 (19.1)	5	3	0
SRUC/SAC	7 (16.7)	2	4	1
AHDB	6 (14.3)	2	3	1
Other consultants	5 (11.9)	2	2	1
Employees	4 (9.5)	2	1	1
NFU	3 (7.1)	1	0	2
Breed societies	2 (4.8)	1	1	0

[a]Indicated used but no usefulness score provided for one participant.
[b]One participant gave a score of 1.5 to indicate both high and medium usefulness and this score has not been included in the usefulness columns.

In addition to these resource-based issues, a lack of practical, and convincing, evidence of the effectiveness of these interventions was also noted. For example, this comment noted the barriers to further practices to manage BVD – '*Cost of ear tags, potential effectiveness – do not know how good the test is*?' (Beef and sheep farmer). This suggests a need to consider the methods used to persuade farmers of the efficacy of these practices, rather than just a need for a greater transfer of knowledge about such practices. These knowledge transfer methods need to take into account points made earlier in this paper around who is sharing the knowledge, what kinds of knowledge and with whom. There needs to be consideration of not only advisor-to-farmer transfer and exchange,[22] but a recognition and consideration of peer-to-peer systems, such as farmer 'field schools' promoted by organisations such as the UN's FAO, flock and herd health clubs[23] and farmer mentoring schemes, for example, the 'Farming Connect' programme in Wales.

CONCLUSIONS

At a time when farmed animal health and welfare are high on the policy agenda in the UK, our research findings build on the views of veterinary, academic, industry and government experts presented in this journal[2] by considering, as a counterpoint, the expertise and perspectives of farmers on key issues in livestock health and welfare. In presenting the view of farmers, we are aware of the risks of romanticising or naturalising farmer expertise and practice. Indeed, despite notions of the 'good farmer' which emphasise the centrality of care for animal welfare to farmer identity,[24] it is important to acknowledge that in some circumstances there may be a lack of care and good practice and that this may manifest as an underestimation of livestock health issues through under self-reporting, or a delay in treatment.[25] While similar disease and welfare concerns were identified by the farmers in our survey and the experts in the Rioja-Lang et al. study, what our focus on understanding different expertise perspectives does provide is additional insights into the complexities and heterogeneity of experience. Using endemic health conditions as a lens, we presented two aspects of our research findings which reveal the different ways in which farmers understand and respond to animal health and welfare issues.

First, our findings suggest that the heterogeneity of farms may go some way in explaining why many welfare priorities are described/identified as complex and multifactorial.[2] We have shown how differentiation (between species and by function) can have a bearing on how welfare and disease issues are understood and responded to by farmers. Our findings also begin to hint at a second dimension of difference, where individual animals are regarded differently depending on their simultaneous memberships of several different groupings. Farmers' attitudes towards and responses to health and welfare issues in their animals were shaped by an interplay of factors related to the role and characteristics of the animal(s) in question. Animals' variable status as pedigree or 'commercial', as members of particular breeds (e.g., as 'native' or 'continental' cattle breeds, or as upland or lowland

sheep breeds), and as included in groups of different ages and with different purposes (e.g., breeding, replacement or store animals), makes a substantial difference to farmers' perspectives on their health and welfare. How specific groups of animals are regarded differently, and present different sets of opportunities and barriers in terms of how they are treated by farmers in relation to health and welfare, is something we are currently exploring in detail through in-depth qualitative research with beef, sheep and dairy farmers in the north of England.

Second, our findings begin to interrogate the notion of knowledge systems which are poorly performing.[2] We propose that unpacking how knowledge is acquired, understood, evaluated and circulated by farmers adds further nuance to understandings of how knowledge systems are functioning in response to welfare and disease issues. Simply saying farmers (and others) lack knowledge about endemic livestock conditions, for example, is too reductive. Our findings suggest that farmers are actively searching for, evaluating and using information on health and welfare acquired through multiple sources and channels. A greater understanding of the wider factors which influence how information is made sense of, how knowledge about animals and their health and welfare is produced in specific farming situations, and how decision-making around health and welfare occurs, is thus needed. Again, our ongoing research is attempting to unpack this complexity where we are finding more variables at play than just disease and health considerations in managing endemic conditions.

Finally, for professional practice, our research highlights the importance of integrating different perspectives and expert knowledges as a more effective way of understanding and responding to animal health and welfare concerns. Facilitating knowledge exchange within and between different groups including peer-to-peer and between different sectors (veterinary, industry, academic *and* farmer) is vital. Herd and flock health planning, co-created by farmers and vets (and possibly other types of advisors including nutritionists, hoof trimmers and mobility scorers) is a key way of combining knowledges while also embracing the heterogeneity of different farms, livestock and farming contexts. These need to be active and on-going processes via, for example, motivational interviewing,[26,27] responsive to changing farmer contexts, circumstances and motivations,[27,28] and crucially, realistic in terms of translating best practice to individual farm settings.

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CONFLICT OF INTEREST

The authors have declared no conflict of interest.

ETHICS STATEMENT

Ethical approval was obtained from Newcastle University's Faculty of Science, Agriculture and Engineering Ethics Committee (reference 7362/2018).

AUTHOR CONTRIBUTIONS

All the authors contributed to the conception and design of the study, interpretation of the data and preparation of the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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