



## Promoting farm advisor engagement and action toward the improvement of dairy cattle lameness

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### ABSTRACT

Lameness represents a significant management challenge in the dairy industry worldwide. In addition to farmers, many advisors are involved in lameness management, including veterinarians, hoof trimmers, and nutritionists. These advisors support farmers through lameness prevention practices, treatments, and advice, but little is known about how advisors view others' roles and the extent to which they work together. This study used qualitative participatory methods to facilitate the formation of lameness advisory groups among 13 advisors (4 veterinarians, 5 hoof trimmers, and 4 nutritionists), with the aims of promoting advisors' engagement with one another and documenting their perceptions of the benefits and challenges of the research activities through semi-structured interviews and thematic analysis. Participants shared predominantly positive views toward the project and voiced appreciation about the quality of discussions and the opportunity to connect and build relationships with other advisors. Participants reported improved communication with others via sharing reports and farm information, as well as increased confidence in reaching out to other advisors. Reported challenges included time constraints and discomfort in leading the lameness advisory group meetings. Difficulties were also found in bringing issues to farmers' attention when they might not align with the farmers' goals or priorities, as well as participants' questioning other advisors' knowledge and intentions. This study describes a promising avenue of facilitating advisor engagement, although more work is needed to determine whether such engagement translates to a reduction of lameness on farms.

**Key words:** stakeholder engagement, communication, animal welfare

### INTRODUCTION

Lameness in dairy cattle involves abnormal locomotion, often caused by hoof lesions from infectious agents or damage to the internal anatomy of the hoof (Murray et al., 1996; Newsome et al., 2016). Lameness is a multifactorial condition that challenges cattle welfare and the economic livelihood of farmers (Whay et al., 2003; Hulsén, 2011; Dolecheck and Bewley, 2018). Due to the multiple factors involved, implementing a change in lameness management may often involve collaboration between farmers and farm advisors such as veterinarians, hoof trimmers, and nutritionists. Although some work has explored the potential of farmer-advisor engagement programs to improve cattle health outcomes (e.g., lameness, Main et al., 2012; Johne's disease, Ritter et al., 2015; calf health, Sumner et al., 2020), relatively little information is available about how advisors interact with other advisors to improve cattle health on farm (e.g., interactions between a hoof trimmer and veterinarian working on the same farm).

People taking on advisory or supportive roles in lameness management should be involved in interventions, as farm advisors are often trusted sources of information for farmers. Veterinarians, for example, provide information on animal health and are influential advisors on animal welfare (LeBlanc et al., 2006; Wolf et al., 2016), while hoof trimmers are viewed by farmers as an important source of lameness management advice (Croyle et al., 2019; Wynands et al., 2021). As of 2013, almost 90% of surveyed US dairy herds performed some hoof trimming, and among those herds, 80.2% employed a professional hoof trimmer (USDA-APHIS, 2018). Dairy farms also commonly employ nutrition service companies to formulate rations, analyze feed samples, and access feed additives, but nutritionists provide further consultative services for farms as well. Previous research including nutritionists has focused on their recommendations on ration formulations (Silva et al., 2019), but to our knowledge, little research has investigated hoof trimmers' or nutritionists' understand-

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ings of their own roles as farm advisors with respect to lameness management.

As we consider complex dairy farm systems and interventions aimed at human behavior change, having a high level of participant interest and engagement is important. Participatory research uses a reflexive and flexible approach in which researchers and participants collaborate at various stages of the research process, for example, in the development of lines of inquiry, methodological decisions, and data collection and in the implementation of results (Cornwall and Jewkes, 1995). Participatory approaches acknowledge that research efforts to understand or influence the management of agricultural systems will only be successful with meaningful participation of system stakeholders (Carberry, 2001). In the case of lameness management, a gap often exists between best practices and management on farms; for example, difficulties may be present in administering timely lesion treatments or utilizing infectious lesion control strategies such as a footbath (Whay et al., 2012; Wynands et al., 2021). Participatory approaches may offer a way to bridge this gap through engaging agricultural communities in intervention planning (Mallonee et al., 2006).

One example of participatory research in agricultural communities involves “stable schools” or “farmer field schools,” wherein small groups of farmers, assisted by a facilitator, meet regularly to discuss specific problems and collectively find solutions (Vaarst et al., 2007; March et al., 2014; Glanville et al., 2020). Such programs have been used to facilitate farmer engagement and action to address numerous dairy management challenges, including the Danish stable schools to reduce the use of antimicrobial drugs (Vaarst et al., 2007) and the Focus Farm program in Ontario, Canada, to address Johne’s disease (Roche et al., 2015). These programs used trained facilitators (a mix of veterinarians and researchers) and self-directed participant meetings; at the conclusion of the projects, the farmer participants reported that the project activities had been valuable and had led to herd improvements. Similarly, the Healthy Feet Project in the United Kingdom used facilitators to provide monitoring and support for farmers to develop lameness action plans (Whay et al., 2012). As a result of that project, farms that were monitored and provided with facilitator support achieved greater reduction in lameness compared with control farms (Main et al., 2012).

Despite the relative success of these farmer-focused projects, to our knowledge, less attention has been paid to the role of dairy farm advisors in supporting farmers to manage issues such as lameness. Therefore, this study used a participatory approach to facilitate the formation of lameness advisory groups consisting of

veterinarians, hoof trimmers, and dairy nutritionists. This article describes our approach and then documents participants’ perceptions of the benefits and challenges associated with the lameness advisory groups, with a focus on how they perceived the process itself in addition to their own and other participants’ roles.

## MATERIALS AND METHODS

The study information and all necessary documents pertaining to ethical approval (e.g., research plans and activities, recruitment, consent form, participant data protection) were submitted and approved as exempt from further review (study number: 00005789) by the University of Minnesota Institutional Review Board. Participants were briefed on the aims of the project and consented to participating. Participants were also informed of their rights to not answer questions and to withdraw from the study at any time.

### *Positionality Statement*

A positionality statement provides the context for a researcher’s relationship to the subject of study as the researcher’s worldview shapes the analysis and conclusions (Cohen and Crabtree, 2008; Holmes, 2020). EW grew up on a dairy farm and has worked with farmers and other farm advisors throughout her research career. This study was carried out as part of her PhD research. SR is an animal scientist and consultant in dairy cattle health and welfare. GC is a veterinarian and researcher specializing in dairy health management and foot health and has previously owned and operated a dairy farm. BV is an animal welfare scientist with research interests in dairy cattle health and welfare and in stakeholder communication. As members of the research team, we each approached this work with the understanding that farm advisors are experts at what they do and that we can learn from their lived experience.

### *Theoretical Framework*

People’s decisions and behaviors are influenced by their individual traits, beliefs, and circumstances, in addition to external contextual factors (Ajzen, 1991; Michie et al., 2011). We used the theory of planned behavior (TPB) to inform our project planning, implementation, and evaluation. The TPB has been used to predict behavioral intention (readiness to perform a given behavior), and it emphasizes the importance of behavioral beliefs (beliefs about the behavior in question), normative beliefs (e.g., beliefs regarding social norms and expectations of others), and control beliefs (the perceived ease or difficulty in performing a behav-

ior). Extensions of the TPB also include background influences such as personality, previous experiences, knowledge, and culture (Fishbein and Ajzen, 2009). The TPB has been used in the framing of multiple projects to investigate the intentions and motivations of dairy welfare stakeholders (Brennan et al., 2016; Dutton-Regester et al., 2019; Sumner et al., 2020). In our approach, we were interested in the impacts of the project on peer views or normative beliefs (by providing opportunities to observe other advisors' approaches toward lameness) and self-views or control beliefs (e.g., advisors feeling they can make a difference in lameness management).

Owing to our qualitative, participatory approach, our results are not meant to be generalizable as defined within a positivist paradigm (Carminati, 2018). Rather, we sought to provide rich descriptions of the data in hopes of upholding principles of transferability such that readers may find them relevant in other situations (e.g., research interventions to address other livestock management challenges, or multi-stakeholder collaborative initiatives seeking to address complex problems in agriculture; Kuper et al., 2008).

### Project Stages

This project involved multiple stages to address our objectives: initial participant recruitment, planning meetings, online pre-survey, workshop, advisory group meetings, and semi-structured interviews. We entered the project aiming to promote engagement between participants, while creating space for participant feedback to help shape each stage of the project (e.g., additional recruitment of participants, activities planned, information and resources provided, timing of activities; Cornwall and Jewkes, 1995). Throughout the project, we sought to ensure that the research activities also served as beneficial extension activities for the participants, so they not only participated in the research but actively benefitted from the process (Bay-Cheng, 2009).

**Initial Participant Recruitment.** The study took place in a region of Minnesota with a high density of dairy farms and ran from April 2018 to February 2019. Further details on the geographic area are withheld to protect participant anonymity. In total, 13 individuals participated: 4 veterinarians, 5 hoof trimmers, and 4 nutritionists.

We initially recruited a single veterinary practice through an email explaining the project (100% dairy production medicine,  $n = 4$  veterinarians at the practice), known to GC via professional networks. A member of this practice had previously expressed an interest in becoming involved in a lameness manage-

ment project. The second stage of recruitment targeted hoof trimmers who worked in a similar geographic area as the veterinarians. Some hoof trimmers were known to EW and GC through their participation in other research projects, while others were suggested by the veterinarians. All hoof trimmers contacted ( $n = 5$ ) agreed to participate.

**Planning Meetings.** Two planning meetings were held in April and June 2018 (one with veterinarians and one with hoof trimmers). The goal of these meetings was to present our vision for the project, elicit participant input about expectations, and clarify any practical considerations for moving forward. We also sought feedback on a lameness risk assessment tool modified from van Huyssteen et al. (2020) and GC's previous work (unpublished) to determine, for example, whether participants would use it and whether it should be altered. The risk assessment is available online (<https://hdl.handle.net/11299/226886>; Wynands and Cramer, 2022). During their planning meeting, the hoof trimmers requested that nutritionists also be involved in the project, sharing that they had strong working relationships with these individuals and that they perceived them to be important lameness advisors. We then asked both veterinarian and hoof trimmer participants to identify potential nutritionists for recruitment and invited these individuals to the project ( $n = 4$  contacted, with all agreeing to participate). We were deliberate in our recruitment process to ensure our participants had shared clients. All participants received an honorarium of \$500 in thanks for their time.

**Online Pre-Survey.** After the planning meetings, all participants completed a 14-item online survey hosted on Google Forms (Appendix A). This survey sought to capture our participants' baseline expectations heading into the project. Questions gathered demographic information (e.g., age, number of years working in their profession, and their continuing education experience) and included 3 open-ended questions:

- What are the challenges of working with other advisors to address lameness?
- What are the benefits of working with other advisors to address lameness?
- What do you expect to gain from the project?

**Workshop.** The next stage of the project was a 4-h workshop for all participants held in August 2018 at a community center central to the region. The goal of the workshop was to generate discussion among participants, establish working relationships between them, and discuss ideas and approaches that could be used in the next stage of the project (advisory group meetings). The workshop was facilitated by EW and GC and at-

tended by all but 1 individual (a veterinarian who was unable to attend but was subsequently provided with resources and participated in the remaining stages). The workshop had 2 stages. First, we divided participants into 3 homogeneous groups (separate veterinarian, hoof trimmer, and nutritionist groups) to discuss their roles and duties when visiting farms, and then all participants came together for a facilitated group discussion about complementary roles on farm (2 h). Second, we divided participants into 3 heterogeneous groups and worked through 2 lameness case studies (2 h). Case studies were short paragraphs developed by GC describing a farm lameness problem (Appendix B). We asked participants how they would approach the described lameness issue if they were working as an individual and then how they would approach the issue if they were working as part of a team.

The workshop concluded with everyone participating in a facilitated discussion of how the different groups approached the case studies and their plans to work together. The next stages of the project were discussed and participants were assigned “homework” to design, initiate, and facilitate lameness advisory group meetings on 2 of the farms where they worked. Individual participants could opt to either work together with other participants and identify shared clients to approach, or they could approach their own clients and request a meeting together with other non-participant farm advisors. We did not specify any farm selection criteria, nor were we prescriptive about meeting format and makeup; participants were simply instructed that the goal of the meetings should be to develop a lameness action plan for each respective farm.

Participants collectively decided to aim for holding 2 meetings within a 4-mo time frame. Some participants expressed an interest in receiving support from EW in organizing meetings. To aid participants in their ad-

visory group meetings and action plan development, we distributed resource toolkits, which included risk assessment, factsheets on assessing a herd hoof trimming program, floor grooving, footbath design, and instructions for using the lameness manager module in DairyComp 305 herd management software (<https://hdl.handle.net/11299/226886>; Wynands and Cramer, 2022).

**Advisory Group Meetings.** In the next stage of the project, participants planned and attended their advisory group meetings (September to December 2018) with email and phone contact and support provided by EW. To encourage participants and to observe interactions between participants and farmers, EW attended as many meetings as possible (6 out of 10 meetings). She then wrote memos following the meetings to capture topics of discussion and attendee interactions (Birks et al., 2008).

Overall, participants held 10 advisory group meetings on 10 different farms (see Table 1). Four participants attended 3 meetings, 2 participants attended 2 meetings, 5 participants attended 1 meeting, and 2 participants did not attend any. All but 1 participant engaged with at least 1 other participant during this stage (e.g., touched base with each other via phone or email to discuss meeting planning; organized, attended, or organized and attended at least one meeting together).

One participant usually took the lead to organize a meeting with other advisors (both participants and non-participants) and one or more farmers. For example, some meetings included herdspeople, on-farm hoof trimmers, and heifer raisers (see Table 1). Meetings were held at the farms, and agendas included the review of farm lesion data, farm walk-throughs, discussion of problems, group problem solving, and goal setting. In addition to the 10 meetings, participants also discussed issues on 5 additional farms but decided not to proceed

**Table 1.** Lameness advisory group meeting profiles<sup>1</sup>

Advisory group meeting	Planning participant	Meeting attendees
1	V3	V3, H4, farmer, veterinary student, hoof trimming assistant, EW
2	V3 and H3	V3, H3, N4, farmer, EW
3	V2	V2, H4, farmer, nutritionist, EW
4	V4	V4, H1, farmer, farm employee, EW
5	H5	H5, V3, farmer, herdspeople, farm employee responsible for on-farm foot treatments, nutritionist, 2 people from contract heifer grower, EW
6	N4	N4, H1, 2 farmers, veterinarian, EW
7	N4	N4, farmer, herdspeople, veterinarian, hoof trimmer
8	V1 and H4	V1, H4, N3, farmer, herdspeople
9	V4	V4, H1, 2 farmers
10	H3	H3, N2, farmer

<sup>1</sup>Project participants are listed by ID, where letter indicates the participant's role (V = veterinarian, H = hoof trimmer, N = nutritionist) and number indicates the individual. Non-participant attendees are listed by role (farmer, veterinarian, and so on), and the researcher is listed as EW.

with meetings for a variety of reasons (e.g., the farmer was not interested, time constraints).

**Semi-Structured Interviews.** Finally, we evaluated the project through individual semi-structured interviews with all participants ( $n = 13$ , January to February 2019). A semi-structured interview format allows for open-ended questions and discussion between the interviewer and the interviewee (Corbin and Strauss, 2008). We first developed an interview guide that included open-ended questions and follow-up probes (Appendix C). The first questions asked participants to recall and describe the research activities, share their assessment of how these activities went, and whether they seemed to have any impact on their client herds. We also asked questions about future directions, how participants thought a similar project would work in other contexts, and whether they had any ideas to improve the process. EW scheduled and conducted all interviews, which were held at locations convenient to the participants (their homes or offices). Interviews lasted 31 to 91 min (median = 60 min) and were digitally audio-recorded and transcribed verbatim by a professional transcription service. Following each interview, EW wrote memos to capture key impressions (Birks et al., 2008).

### Data Analysis

**Online Pre-Survey.** Demographic data from the online pre-survey were descriptively summarized. Responses to the open-ended questions were also descriptively summarized within their respective categories: (1) benefits to advisor collaboration, (2) challenges to advisor collaboration, and (3) expected project benefits.

**Semi-Structured Interviews.** Following transcription, EW checked the transcripts for accuracy against the original audio. The qualitative methodology of thematic analysis was used to identify, analyze, and report patterns in the written data (Braun and Clarke, 2006). EW coded the transcripts from a deductive perspective by considering (1) what worked (benefits) and (2) what did not work (challenges). These questions represented a priori themes and were applied to participants' discussions about all stages of the project, including participant recruitment and planning meetings, workshop, and advisory group meetings. Additional data sources were used to supplement coding and interpretation. These sources included memos written by EW after the advisory group meetings and interviews, as well as written action plans from participants. Memos containing notes on key impressions and which advisory group meetings the participants attended were reviewed before reading the corresponding transcript to aid in keeping track of each stage.

After the initial round of coding, EW consulted with SR, GC, and BV to organize and finalize the theme list and descriptions. Throughout the analysis, EW wrote memos to explore and reflect on the data. All transcripts were labeled and coded using the qualitative data analysis program Quirkos (Quirkos Ltd.). Quotations are presented in the results as examples of the themes described in the participants' own words. Square brackets indicate authors' additions for clarity, ellipses indicate where text was omitted, and quotations are labeled by the participant ID, with the letter indicating the participant's role (V = veterinarian, H = hoof trimmer, N = nutritionist) and the number indicating the individual.

## RESULTS

### Participant Description

All participants ( $n = 13$ ; 4 veterinarians, 5 hoof trimmers, 4 nutritionists) were based in Minnesota. Eleven participants identified as men and 2 as women. Participants ranged in age from 30 to 62 yr (mean = 46 yr), and they had worked in their profession from 3 to 37 yr (mean = 19 yr). The number of herds they worked with ranged from 15 to 45 (mean = 28). All but 1 participant had undertaken continuing education in the past year. Continuing education activities included professional conferences, meetings, webinars, and farm visits with peers or industry leaders. All hoof trimmer participants had received formal training. Answers to the open-ended questions from the online pre-survey of participants' baseline perceptions about challenges and benefits of advisor collaboration, and expectations of project participation benefits, are presented in Table 2.

Themes were organized around 2 questions: what were the positive aspects of the project as perceived by participants (theme 1: benefits) and what were the challenges (theme 2: challenges). Theme 1 included participants' interactions with one another, appreciation of the process itself, and reported intention and behavior changes. Theme 2 described challenges related to comfort zone, unclear research goals, distrust of other advisors, farmer-level barriers, and process limitations (Table 3).

### Theme 1: Benefits

Overall, the project was viewed positively by participants, who reported that the project was both personally and professionally valuable for them. For example, one hoof trimmer (H5) commented, "I'm just glad that you asked me to be a part of it. I appreciate that, because again, I'm always trying to do my best to

**Table 2.** Online pre-survey responses from 13 dairy farm advisor participants about baseline perceived benefits and challenges to advisor collaboration and expectations for the project

Benefits and challenges	Expectations for the project
Benefits to advisor collaboration	Information sharing and better relationships with other advisors; someone to brainstorm solutions with and to help explain things to the farmer; everyone sees the cows in different settings, so together we can get a better overall picture of lameness management on the farm; reduced lameness; healthier, more productive cattle (n = 12) No benefits (n = 1)
Challenges to advisor collaboration	Communication; do not get to meet regularly; time and scheduling; farmers and their level of interest in lameness; false information and egos (n = 13)
Expected project benefits	Learn what the other people on the dairy team expect from me and how we can assist each other better; networking and meeting new people; a better understanding of hoof issues, treatments, and preventative options as well as becoming more involved in hoof health (n = 10) I don't really know what to expect (n = 2); I expect advisors will argue with one another (n = 1)

improve and learn...it gets you out of your comfort zone a little bit, too.” Some participants also suggested that others benefited from the project, for example, participant H3 said, “It was a good review. Both farmers thought it was awesome, and one farmer said, ‘I didn’t really know what to expect.’ The owner, he goes, ‘but that was really, really productive.’ I felt the same way because I didn’t really think that—I didn’t know what to expect, either. And I felt it was pretty productive, especially with the specific action plan.”

### Interactions with Other Advisors

Participants appreciated the opportunity to meet with other advisors: “It’s nice to know that the people who are working in the same field or profession as you, you can bounce ideas off of them and talk and share things with. That’s just a small side effect from some of these meetings that I feel like I’ve gotten a better

relationship with a few of the trimmers” (H5). Bringing together hoof trimmers, nutritionists, and veterinarians for the workshop was described as a new experience by some. For example, participant N3 said, “...just getting vets, and consultants, and trimmers together, I thought that was really good, and that’s something that we should do more often...I don’t know if I’ve ever been in the same room with that many qualified people together all at once.”

**Relationship Building.** Although some participants knew one another, others did not and reported the opportunity to forge new contacts as valuable: “I thought it was nice for everyone to get to know each other and learn each other’s personalities or that you existed” (V1). Participant comments often revealed a shift in beliefs toward their peers, for example, reporting favorable perceptions toward other advisors as a result of learning more about their level of knowledge and interest: “I was impressed at the level of interest,

**Table 3.** Themes, subthemes, and descriptions capturing veterinarians’, hoof trimmers’, and nutritionists’ discussions on benefits and challenges associated with the dairy lameness extension project

Theme	Subthemes	Description	
Benefits	Interactions with other advisors	Valuing the ability to meet with and have meaningful discussions with other advisors on the topic of lameness management. Risk assessment was seen as beneficial to start engaging in this topic. Appreciation for the opportunity to meet others in person and for the ability to inform the project process from the start.	
	Relationship building		
	Process		
	Risk assessment		
Challenges	In-person	Participants began sharing farm reports and data with other advisors and reported stronger intention and confidence in future proactive collaboration with advisors and farmers.	
	Participatory		
	Intention and behavior change		
	Report sharing		
	Increased collaboration		
	Unclear research goals and intentions		Skepticism of the goals or intent of the project.
	Discomfort with the role		Uncomfortable with individual expectations, or uncertain that activities fit their self-identified role on the farm.
Challenges	Distrust of other advisors	Questioning other participants’ skills, knowledge, and/or intentions. View of other advisors as competitors rather than teammates.	
	Farmer-level barriers	Concern that farmers may not want to prioritize lameness management. Difficult to develop farmer interest or buy-in for lameness action plans.	
	Process limitations	Difficult to identify and recruit herds, wanted more structure or guidance for the project, concerned workshop/meetings take too much time.	
	Herd selection		
	Project elements and structure		
	Time demands		

particularly by the hoof trimmers primarily. And not just interest in the topic [of lameness], but interest in communicating and being in the loop” (V3). Participants reported that the advisory group meetings generated good discussion with the different attendees: “That [meeting] was with me, the producer, the herdsman, and then the trimmer...felt like a lot of really, really good [discussion stemmed] from that. There was actually some action that stemmed from that meeting” (V4). The project also served to remind participants of the value of teamwork and to highlight that other farm advisors can be a resource for them. For example, participant N4 said, “There continues to be value in groups working together, teamwork. I’ve known it for a long time... This project reiterated it. You can get stuff accomplished when you work together and can talk, give more—what’s the right word? More options from that team approach... They bring different things.”

### Process

**Risk Assessment.** The optional risk assessment tool provided to participants was used and appreciated by most advisory group meetings. For example, a veterinarian (V1) shared, “I really liked the assessment spreadsheet because I don’t think one single person can answer all these questions. Doesn’t matter if you’re the farm owner or the herdsman or the hoof trimmer or the nutritionist, we can’t answer this accurately without talking to each other. So, I guess that’s what I liked, it encouraged us to have conversations.” Participants also appreciated that the risk assessment provided an area of lameness management to focus on: “I was apprehensive at first. I just thought, gosh, all these pages of questions, how is this going to go? But when you really get into it, you can go through the questions very quickly and get the answers you need and then find the focus area and get it taken care of” (N4).

**In-Person Approach.** Participants had the option of holding the advisory group meetings remotely or discussing the action plan via email, but all participants chose to have their advisory group meetings in person. For example, participants commented, “I communicate a lot better in person. Emails, are they going to read all of it or are they just going to skim it, delete it?” (H4) and “I think trying to do it any other way would have been difficult to get the same amount of—to get everybody on the same page and also get a little buy-in as far as doing something for follow-up. I think the in-person approach was valuable” (V3).

**Participatory Approach.** Finally, participants also liked being able to share input and have control over the way they structured their meetings, saying “I really liked the idea and how you brought it towards us and

you really took our input” (H5) and “I’m glad that you reached out and we did that, so we had an idea before we had the workshop” (V1).

### Intention and Behavior Change

**Report Sharing.** Some participants noted that they had begun changing how they shared data with other advisors (with the consent of the farm). For example, participant V3 commented, “We always have a report. So, what we do is—we will include the hoof trimmer in that report since this meeting. And I have gotten responses back from three hoof trimmers with some comments about things they were seeing...we do see more communication follow-up both ways since then.” Participant H1 similarly shared, “They [veterinarians] will email me the herd report and I’ll email them my trim report. The nice thing is I really enjoy reading their notes.”

**Increased Collaboration.** Participants also shared that that they intended to collaborate more with each other, as described by one of the nutritionists (N4), “So I learned a lot there, and he [H3] would definitely be somebody I would talk to in the future if I ended up with other herds that he trims for...he’s very active and he was great...” Another reported change was an increase in confidence when reaching out to other advisors. As participant V1 shared, “Most people, if I approach them, they want to work with me. Like it’s okay to reach out to them and not be nervous about that. Because if I’m respectful and communicate that I value their opinion and I think there’s an issue, usually you have a good working relationship. So yeah, I really value the relationships I got out of doing this project and I do think that they will persist on some farms.” Participant H4 echoed this sentiment, saying “The most important thing that I took away was that other people are willing to work with you and want to know what’s going on as well, and are willing to help make it happen...call somebody. Get someone else involved. And now you know, after working with them on these projects, that they’re more than willing to help out.”

### Theme 2: Challenges

Despite the positive reception the project received overall, participants also related challenges faced in the process and shared their recommendations for future approaches.

**Unclear Research Goals and Intentions.** Despite our efforts to provide adequate information to our participants, some still had questions about the goals of the project, as explained by participant N2, “I’m questioning where this really stems from. Was [it]

that somebody felt there was a need for hoof health improvement? How did this get started? Because in my area, we're very blessed...for the most part it [lameness] is really not an issue."

A few participants also questioned our motivation and intentions in doing this research. For example, "I said when this whole thing started, I thought maybe it was a conspiracy theory against me...I don't think my herds are that bad...but it turns out it wasn't like that. It was just to help everybody (H4)." When participant H4 was asked if we could have done anything at the start of the project to ease his skepticism he responded, "I just had to see it play out."

**Discomfort with the Role.** As part of the project, we asked participants to recruit farms for a lameness advisory group meeting, which may have been outside their perceived role on the farm, as N2 described: "How do I initiate this? Can we do better with lameness? Is that really what the farmer wants me to do? I don't know. Because let's say I offend the client by getting into the lameness side. He may look at me and go, well, what do you know about that? That's not your deal." In addition to asking participants to reach out to farmers, we also asked them to lead a meeting and some participants reported not being comfortable in the role, for example, "I think it's just trying to take charge of—it's just not really my comfort zone (H1)."

**Distrust of Other Advisors.** Some participants also questioned other participants' skills, knowledge, and intentions relative to lameness management. For example, one hoof trimmer (H3) shared, "I would say way less than 50 percent of hoof trimmers know not to put the grinder between the claws. If they're running the meeting, if somebody like that who doesn't even know basic anatomy is running the meeting, what could be accomplished...I think there's some basic qualifications that even most vets and most nutritionists have that this industry just does not. It just doesn't." Participants recognized that some advisors may be more knowledgeable in lameness management than others, for example, participant N2 said, "I know the steps and balances for the most part, but what vet would know? Vets maybe would know some, but then it's been a lot of years and they haven't looked into it. Are feed guys going to know?" Participant V3 similarly shared, "So the hoof trimmer—they're doing feet every day and they're thinking of reasons why stuff happens. And it might be building design, it might be cow handling, it might be dirty cows, it might be nutrition. And we would look at it the same way—whereas a nutritionist's focus is narrower just by nature. And they may [have] as much knowledge in those areas, but they may not."

A similar challenge noted by some participants was the difficulty in bringing together competitors (e.g., 2

nutritionists working for different companies) and how that could affect participants' willingness to engage in discussions. For example, participant H2 said, "I think it would be pretty hard to get rid of the competitiveness in any room on anything like that. The one thing that you had going, I think all of the vets were from one office so they're a team. And then as you noticed, the nutritionists, they were all from different offices, so they were kind of hard to really—they didn't want to let none of their secrets out of the bag. It's the same way with the hoof trimmers." Participant N2 offered a similar description: "Okay, so we have competitors in the same room. So are we really, let's say that I'm a little insecure about something going on at the farm. And I'm probably gonna try to hold back information because competitors, veterinarians, everybody's in there with eyes on."

**Farmer-Level Barriers.** This project was developed at the advisor level, and participants were cognizant that making an on-farm change required the interest, availability, and enthusiasm of the farmer. As one veterinarian (V3) described, "It's always a little hard when you have—it's not being driven by the farm, right? So that's always a little challenging because farmers have lots of problems to deal with. So, we decide that this is important, and maybe for them you worry that it may not be something they necessarily want to address...I think as you look going forward, that initial farmer buy-in—if you don't have it, it's going to be really hard. And luckily for me with all three of those, I think it worked well. But I see situations where it's not going to work so well. If we're pushing it, and it's not the farmer's goals, it's not going to work." Similarly, some participants reported farmer disinterest or a low prioritization of lameness as a challenge for recruiting farms to hold advisory group meetings, for example, participant N2 said, "We had some other herds in mind. Didn't want to do it. Probably they feel lameness wasn't an issue, which it [lameness] probably isn't [on those herds]." Finally, some were simply reluctant to add additional tasks to farmers' plates, with participant N2 saying, "Just from experience, how many tasks can you give a farm to change anyway? How many things in a year can they realistically work? I mean, a lot of time it's two."

### Process Limitations

**Herd Selection.** One difficulty described by several participants was recruiting farms to participate (i.e., some had only a few client herds, which overlapped with other participants). In this situation, these participants were faced with having to recruit the farmer but also the associated veterinarian, hoof trimmer, or

nutritionist as well. For example, participant H1 said, “You know one farm, the owner was real interested, but you know his veterinarians hadn’t been a part of this meeting and his nutritionist hadn’t been a part of this meeting.” Participant V1 suggested making more time for identifying potential herds to approach, “But I wonder if there would have been some value in having a short brainstorming session for people...like [to identify] people who work on the same farms.”

**Project Elements and Structure.** Some participants reported the workshop could have been more engaging, for example, “Just for a visual, for myself, maybe have one person record when each person shares common ideas” (H5). Some participants also suggested offering additional incentives to participants, for example, presenting resources on the latest lameness research: “I know I said it shouldn’t be any longer but to help incentivize people coming you know is to have a review of some data piece or something that would be applicable to both veterinarians and hoof trimmers plus or minus the nutritionists” (V1).

A few participants also requested more guidance throughout the project, with participant V3 saying “Maybe some more structure—what to expect...when you approach people, you say, ‘Okay, here’s how this is going to work. Here’s what we’re going to have at the end. Here’s what it looks like.’... I think more of a set structure, saying, ‘Okay, this is going to happen. Here’s your version—here’s your copy of how this is going to happen. Here’s what we expect to happen. Here’s what we expect for your follow-up.’”

**Time Demands.** Finally, participants were cognizant of the time and advance scheduling involved, as participant N3 shared, “But, if you have another one [workshop], keeping it rolling and keeping it concise.” Participant H5 added, “There’s always something to be done, right? The tricky part is finding the time in everybody’s schedule.” Participants were also concerned about wasting other participants’ and farmers’ time. For example, as participant V3 explained, “But you still have that—anytime you schedule a meeting, time’s valuable. And so, who’s going to pay for that time? And the farmer has to, in a way, get paid for that time somehow. The hoof trimmer has to get paid for that time, the vet has—so it really has to be worthwhile, and it’s got to come from somewhere. And that’s ultimately the challenge, I think, in those kinds of programs.”

## DISCUSSION

The goal of this participatory research project was to facilitate the development and implementation of lameness advisory groups among dairy veterinarians, hoof trimmers, and nutritionists, and to explore these

advisors’ experiences of their participation. Our results suggest that the approach investigated here was overwhelmingly viewed as a productive experience. Nonetheless, participants also shared challenges faced in the process; collectively, our findings inform recommendations for facilitating collaborations between dairy farm advisors.

### Project Strengths

Overall, participants reported highly positive views toward the project, highlighting the opportunity to build relationships and identifying specific elements of the approach as beneficial to them professionally and personally. In many cases, these aspects appeared to generate a change in practice or an intention to change in participants’ work. Participants liked discussing lameness issues with one another, learning about one another, and gaining a different view on lameness management on farms. Previous participatory work with farmer participants has found similar positive social interactions in both peer-to-peer and farmer-to-facilitator interactions (Ivemeyer et al., 2015; Roche et al., 2015; Morgans et al., 2021).

Our participants also identified specific elements of our approach that they found to be particularly helpful, for example, in-person meetings, inclusion of their voices from the start, and use of the risk assessment tool to provide a common foundation to start discussions, which was found to be particularly valuable on farms that had little lameness data recorded. In a previous study, van Huyssteen et al. (2020) evaluated a lameness risk assessment against herd lameness and lesion prevalence and found that the associations were nonexistent or weak. Although their risk assessment lacked accuracy, they similarly viewed it as a helpful approach for generating discussion between producers and advisors. Lam et al. (2011) noted that asking open questions and personalized messages, such as in a discussion generated by a risk assessment, is an effective strategy for veterinarians to improve their influence on farms. Collectively, our results contribute to the growing documentation that risk assessments can be useful in fostering successful, multi-advisor collaboration toward development of on-farm herd health solutions (Roche et al., 2015; Sumner et al., 2020).

We used the TPB (Ajzen, 1991) as the theoretical foundation for this project, and our results suggest that we influenced peer views (i.e., normative beliefs) and self-views (i.e., control beliefs). Specifically, participants described being pleasantly surprised by how knowledgeable others were about lameness and felt more confidence in reaching out to discuss lameness with other advisors or farmers. In the context of our

project, this outcome resulted in participants reporting changes related to behavioral intention (planning to reach out to an advisor about a particular farm) and behavior change (started to share herd reports with one another). Our results largely point to the importance of interpersonal relationships and facilitating positive interactions. The results from our project support findings from Morgans et al. (2021) that a combination of empowerment and support from peers and facilitators was key to influencing behavior change related to antimicrobial usage.

### Project Challenges

Although participants generally responded positively to engaging with other advisors, our approach could be refined to better address participants' concerns about the research goals and the roles taken. Participants likewise encountered challenges involving interpersonal dynamics, farmer buy-in, project structure, and time constraints, which should be considered in future efforts to design similar strategies.

Although a few participants reported increased confidence after having gone through the process, some were intimidated or uncomfortable with being asked to initiate and lead an advisory group meeting. Morgans et al. (2021) used professionally trained facilitators in an intervention to reduce antimicrobial use to keep meetings focused, engage all farmers, help farmers address problems, and facilitate peer-to-peer learning, and this approach may offer an improvement over ours. Offering advisor participants facilitator training may likewise assist them in leading advisory meetings; for example, Roche et al. (2015) trained veterinarians to act as facilitators for farmer groups on managing Johne's disease. This led to positive outcomes in on-farm changes and decreased the risk of Johne's disease, but this approach has potential limitations. Veterinarians and other advisors are used to providing expertise, so they may not appreciate or necessarily welcome the knowledge and contributions of other advisors or farmers. Furthermore, they may not agree with the philosophy of facilitating a farmer-led approach. Nonetheless, as advisors work to influence farm decisions, they may see a benefit of offering facilitation as an advisory service (Morgans et al., 2021).

Another challenging issue was participants distrusting one another or questioning others' knowledge or motivations. This barrier has also been reported by dairy farmers who believed that farm consultants do not work well together (Croyle et al., 2019). Many participants in the current study raised such distrust as an issue in the interviews in an abstract way (e.g., what if the farm veterinarian doesn't know anything about feet

and gives them bad advice), although it did not seem to constrain progress in the advisory group meetings. Rather, when speaking about participants, the majority seemed satisfied or even impressed by the other advisors' judgment and knowledge. This satisfaction could be explained by our participant pool: given that they chose to participate in a lameness management project, they are likely more knowledgeable than average and more likely to have concerns about the knowledge or intentions of others.

Notably, some participants described the social complexity of advisor-advisor relationships. Some advisors would be classed as competitors, for example, if 2 nutritionists were working in the same area but for different companies. Participants viewing others as competitors may have been reluctant to share their knowledge or barriers they faced in their work. Cooperating with competitors can have advantages, such as improving the value of the services offered and increasing industry sustainability through the ability to address risks as a group (Gnyawali and Park, 2011; Peng et al., 2012). In our facilitation, we tried to be sensitive to the competition issue; for example, we did not ask participants to discuss specific farms they worked with but rather provided fictitious case studies. Issues of competition could be further mitigated by using impartial "brokers" (i.e., facilitators) to help set up discussions focused on the benefits of the end-user (i.e., farmers). Such facilitators could take on the role of bringing together the necessary people, even if they are competitors, and find ways to have discussions that put the farmer first (Klerkx and Leeuwis, 2009). The use of neutral knowledge brokers has been used successfully to create relationships among groups of people with shared concerns within healthcare systems (Conklin et al., 2013).

As part of the participatory approach, we expected participants to take ownership over how they proceeded with their plans, rather than being highly prescriptive. Dairy farmers and veterinarians have previously shown a preference for autonomy in participatory programs (Sumner et al., 2020; Morgans et al., 2021). Although this approach seemed to work for most participants, some reported confusion related to project expectations. It is possible that scaffolding the "assignments" more may have helped this (i.e., breaking up the activities into stepwise sections before proceeding to the next step), or we could have included more opportunities for participant check-ins with the research team so everyone felt clear and confident about how to move forward.

Finally, participants expressed concerns about limits on their own as well as farmers' and other advisors' time. Indeed, time constraints are widely documented as a significant perceived barrier facing farmers and

advisors (Leach et al., 2013; Ritter et al., 2017; Roche et al., 2019). As we consider time constraints as well as reaching a wider group of farmers and advisors, we have several recommendations for smaller-scale opportunities to facilitate discussions between farmers and multiple advisors. These recommendations include holding continuing education events for multiple advisor groups and farmers, lameness research conferences that include hoof trimmers and hoof trimmer experiences, and veterinary schools introducing veterinary students to the hoof trimming profession.

### Study Limitations

The results we present here should be interpreted with caution. First, the participants in this project were self-selected, and we acknowledge that those who chose to participate in this study were likely already interested in lameness management or were more progressive. Future work should aim to engage advisors that are harder to reach to enable including those with a larger range of values and perspectives. Another challenge is social desirability bias, a tendency for participants to answer questions in a way that others will view them favorably (Polkinghorne, 2007). Such bias can never be fully eliminated, but we tried to encourage truthful responses through careful interview techniques, such as reminding participants that questions had no correct answers, leaving enough time in the interview for participants to fully consider the questions, and revisiting any contentious topics later in the interview (Polkinghorne, 2007).

This project was also limited by its short timeline and modest intervention. Without long-term sustained engagement, it is difficult to create a lasting change. Owing to the project timeline, we do not know how the reported attitudes translate into action, nor do we know if the reported changes will be sustained. Previous participant-led interventions aimed at changing on-farm practices have been quite extensive in the length of the interventions and time commitment required from both researchers and participants (Vaarst et al., 2007; Morgans et al., 2021). Although this project is more modest in its intervention, we suggest that our multi-stakeholder workshop represents an example of a more attainable change that the industry can make to foster advisor collaboration.

We did not center farmers in the project, but rather farm advisors as trusted sources of information within agricultural systems. A strength of this advisor-centered approach is that we recognize that decision-making on a farm is influenced by social referents (Mills et al., 2021). Farmers and other stakeholders exist within

communities, which creates multiple avenues to influence change. Previous research has generally focused on single farms and a single advisor, but farmers work with and receive advice from multiple advisors. Our project highlights some of the challenges and benefits of multi-advisor teams. Although participants did perceive positive outcomes of advisor engagement, they also recognized the limitations of this approach. In particular, they noted that farmers are decision makers and that if a farmer is not interested in pursuing improved lameness management as a goal, an advisory team can only do so much. Furthermore, an intervention aimed at advisors may change their practices but may not translate to changes at the farm level. For this reason, we recommend that future programs include farmers and center their priorities and goals.

Finally, we did not include any animal-based measures, as that was beyond the scope of the study. Due to the chronic nature of lameness, even multi-year studies have difficulty measuring changes at the cow level (Bell et al., 2009). Participants may have reported a change was made, but we have no way of evaluating if it made a difference at the cow level. We recommend that future projects include the number of changes made and what they were, and determine if the incidence of lameness changed.

### CONCLUSIONS

Lameness management on dairy farms represents a formidable challenge. In this study, we implemented a participatory multistage approach to engage and support individuals holding key advisory roles (i.e., veterinarians, hoof trimmers, and nutritionists) in developing lameness action strategies. The individuals involved largely viewed the research activities as beneficial in building relationships with other advisors and in promoting changes in how they approached lameness management. We suggest that future efforts to engage farm advisors in dairy health management should address interpersonal issues involving trust of others, weigh time limitations, and involve farmers as key participants.

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## APPENDIX A: ONLINE PRE-SURVEY

## Demographics

What is your name?

What is your age in years?

What is your gender? Male, Female, Prefer not to say, Text box to self-describe

How many years have you worked as a (veterinarian, nutritionist, or hoof trimmer)?

What is the approximate number of herds you work with?

What is the approximate number of cows you work with?

What is the highest level of education you have completed?

In the past two years, have you participated in any continuing education? Yes No

[If Yes]: For the past 2 years, please list the continuing education activities you have participated in: (e.g., conferences, practical demonstrations)

The next questions are short answer. Please feel free to answer in point form.

What are the challenges of working with veterinarians and/or hoof trimmers and/or nutritionists to address lameness?

What are the benefits of working with veterinarians and/or hoof trimmers and/or nutritionists to address lameness?

What do you expect to gain from the project?

**APPENDIX B: WORKSHOP CASE STUDIES**

Case study 1: A client with a 400-cow dairy has become concerned with the level of digital dermatitis (DD) in their herd. They attended a meeting put on by a supplier that suggested they score cows in the parlor for DD and 70% of the cows have evidence of DD lesions. They are currently spraying feet with Lincomycin weekly and run a copper sulfate footbath 2 times per week. They have asked you for input to develop an action plan.

Case study 2: A client who has a 1600-cow dairy has recently noticed an increase in lame cows due to what appears to be sole ulcers. The dairy converted from mattresses to recycled sand in the past 5 years and added a cross vent barn for milking cows. They recently built a cross vent barn to house calves and dry cows. They have asked for your input to fix the situation.

**APPENDIX C: INTERVIEW GUIDE*****Recall and Describe the Process***

Are there any particular elements of the planning meetings/the workshop that you found helpful? Was there anything you didn't like/didn't work well in the planning meetings/workshop? Is there anything we should know to improve them?

Can you share with me what happened after the workshop regarding your advisory group meetings?

I'm interested in how you recruited your farms, stayed connected, and communicated with each other, can you tell me about that?

Can you share what you did to follow up on action plans?

[Did not complete advisory group meetings] Was there anything in particular that prevented you from doing the advisory group meetings?

Were there any barriers to recruiting farms, staying connected, or communicating with each other?

Are there any particular elements that you liked, or that worked well in the advisory group meetings?

Are there any things that you didn't like, or that didn't work well? Is there anything that you would have wanted different or changed?

What do you think the other advisors thought of the process?

***Impact on Farmers/Herds***

Do you think this process had any effects on the farms you worked with? Please share.

Did they make any management changes?

Did you detect any change in your relationships with the farmers, or your dynamics?

Would you recommend another one of your herds participate in this project? Why/why not?

***Future Direction***

Do you have any plans to follow up on anything with the farms you did your advisory group meetings with?

Are you interested in integrating this approach into your routine/approach?

Do you think this type of process is useful/could work on a larger scale?

Do you have any suggestions of things that we could have done better to encourage continued engagement?

What is the biggest suggestion you have for us from participating in this project? What is the most important thing you took away from this experience?

Is there anything else you would like us to know?