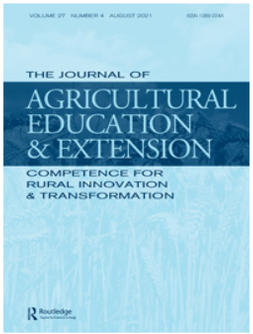

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Videos and podcasts for delivering agricultural extension: achieving credibility, relevance, legitimacy and accessibility

Charlotte-Anne Chivers [a], Katie Bliss [b], Auvikki de Boon [c], Lydia Lishman[b], Juliette Schillings[c], Rachel Smith[c] and David Christian Rose [c]

[a]Countryside and Community Research Institute, University of Gloucestershire, Cheltenham, UK; [b]Organic Research Centre, Cirencester, UK; [c]School of Agriculture, Policy and Development, University of Reading, Reading, UK

ABSTRACT

Purpose: To explore the perceived credibility, relevance, legitimacy and accessibility of videos and podcasts in farm extension.

Methods: A two-phase mixed methods approach consisting of a pre-COVID online survey of farmers ($n = 221$), farmer telephone interviews ($n = 60$) and in-person focus groups of farmers ($n = 4$) followed by an analysis of how viewers interact with Agricology videos and podcasts, a further online survey ($n = 141$) and online farmer focus groups ($n = 4$) during the COVID-19 pandemic.

Findings: If they are to be perceived as effective extension methods, videos should be short, concise, practical, advert-free and visualise how to implement a practice. Podcasts can be longer, more detailed, and allow multitasking. Both should use farmer-friendly language, be easily accessible, high quality, non-biased, and be created by someone whom farmers respect.

Practical implications: Helps policy-makers and extensionists understand the potential of videos and podcasts and the trade-offs in using them with other forms of extension. The findings are also of use to global advisory services seeking to offer hybridised advice as a result of the ongoing COVID pandemic.

Theoretical implications: Elucidates the trade-offs of using videos and podcasts when face-to-face extension is not possible and develops the CRELE framework.

Originality: Discusses the role of podcasts in farm extension and re-evaluates the role of videos when face-to-face extension is impossible.

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COVID-19; Extension; Knowledge exchange; Podcasts; Videos

1. Introduction

As a consequence of the many challenges facing the farming industry, agricultural policy is changing across the world. For example, the European Union are reforming the Common Agricultural Policy (EU Commission 2021), whilst agricultural policy in the

CONTACT David Christian Rose d.c.rose@reading.ac.uk School of Agriculture, Policy and Development, University of Reading, Reading RG6 6 EU, UK

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UK is on the cusp of the largest transition in a generation due to Brexit, with new environmental land management support schemes being designed at the time of writing (Hurley et al. 2020). The World Bank (Schroeder, Lampietti, and Elabed 2021) speaks of a need for a 'digital transformation' of agriculture worldwide to meet the Sustainable Development Goals. Good extension will be crucial in supporting farmers to make a just transition towards new policies in Europe and across the world (Hurley et al. 2020; Vigani et al. 2020).

Face-to-face methods are generally recognised as the most effective way of conducting knowledge exchange with farmers through demonstration and peer-to-peer learning and one-to-one discussion with a trusted advisor (Dwyer et al. 2007; Ingram et al. 2018; CSF Evidence Team 2019). Although digital extension methods have been used in farm extension for several years, with the onset of the COVID pandemic there has been increasing delivery of extension through methods such as webinars, videos, and podcasts. In the absence of face-to-face farm extension, this paper explores the potential of an increased role for online videos and podcasts in the extension landscape. If seen as credible, relevant, legitimate, and accessible ways of receiving farm extension, these tools may be used in and beyond the current pandemic, in particular where extensionists begin to offer hybrid advice, combining digital and face-to-face approaches.

Academically, this study furthers knowledge in two ways. Firstly, in building on existing research on the use of videos in farm extension, we examine key learnings in the context of the COVID pandemic, which may have led to farmers re-evaluating different forms of learning in the absence of face-to-face events. Secondly, there is limited academic research on the role of podcasts in farm extension, and thus we undertake to compare and contrast this mechanism vis-à-vis videos and others. Through a mixed-methods study involving a literature review, an analysis of online video and podcasts views, online surveys of farmers, and farmer telephone interviews and focus groups, we investigate the role of videos and podcasts in farm extension. We discuss the trade-offs associated with the use of videos and podcasts vis-à-vis other methods of extension, which the pandemic has explicitly forced farmers and extensionists to consider.

2. Lessons from existing research

We note that although the rise of COVID has increased interest in digital farm extension, the trend towards more digitalisation of interactions between farmers and advisers was already occurring before the onset of the pandemic (Fielke, Taylor, and Jakku 2020). For example, Van Mele (2011) found that 78% of surveyed extensionists show training videos to farmers. Fielke, Taylor, and Jakku (2020), before COVID, predicted that social interaction would become increasingly mediated by technology. In a Global South context, Steinke et al. (2019) referred to a 'digital revolution for agricultural extension'.

Most existing studies on the use of videos for agricultural extension have been carried out in developing countries (primarily across Africa). These studies have found that video content is perceived by some farmers as of comparable effectiveness against more traditional in-person extension (Bello-Bravo and Pittendrigh 2018; Maredia et al. 2018; Thomas, Bowling, and Brewer 2018; PLAID project 2017; Bello-Bravo et al.

2019). Bliss et al. (2019) found that farmers participating in the OK-Net Arable project exhibited a clear preference for visual modes of dissemination, whilst Baugher et al. (2017) found that videos shown during workshops were a top-rated learning method alongside on-farm demonstrations by Hispanic/Latino crop growers in the U.S.A. Moreover, Chowdhury et al. (2015) found that video-mediated learning worked better than face-to-face extension in their study.

Table 1 provides an overview of the benefits of video content for agricultural extension.

Common recommendations for producing effective videos are provided in Table 2, with an extensive guide provided by the PLAID project (2017).

The literature also notes some limitations of using videos as a form of extension. Common limitations included the inaccessibility of some videos because farmers cannot find them, do not have access to the internet or lack the digital skills to find them (Steinke et al. 2019). For example, Van Mele (2011) found that a Google search for a video on 'soil fertility' results in 640,000 hits. As a result, 1 in 6 respondents had used YouTube or Google to find farming videos but either couldn't find what they were searching for or ended up distracted by irrelevant videos (Van Mele 2011). There can also be a loss of fine detail if videos are kept short to boost engagement, whilst the lack of face-to-face contact can mean that farmers can misunderstand parts of a video without the ability to ask questions easily (Vasilaky et al. 2018). Videos should be used in conjunction with other extension methods and cannot replace existing knowledge exchange approaches as research cautions against the overreliance on non-face-to-face forms of knowledge exchange as it lacks a personal touch (Karubanga et al. 2019; Klerkx and Proctor 2013).

First coined by Adam Curry of MTV (2004), the term 'podcast' combines the words 'iPod' and 'broadcast'. Podcasts are already hugely popular in the general population as they can be produced quickly and easily (Lee, McLoughlin, and Chan 2008). Podcasts were originally developed to overcome issues with bandwidth speeds which made it difficult to broadcast online by feeding in rich media slowly by being permanently online, with recordings made available to listeners once they're uploaded (Lee, McLoughlin, and Chan 2008). This means that unlike videos, podcasts can be accessed by those with relatively weak internet connections. There has been limited research on the use of podcasts in farm extension; this is, therefore, the first study of its type. Existing research has, however, been undertaken to understand the role of radio in farm extension, an alternative but similar audio mode of extension. Radios have become a useful

Table 1. The benefits of using video content for agricultural extension according to existing studies.

Benefit	References
Capacity to provide demonstrations of how to perform a new management practice more effectively than written information	(Van Mele 2011; Zossou et al. 2009),
Relatively low cost to produce and disseminate	(Van Mele 2011; PIAID project 2017)
High accessibility to a large audience independent of location (provided there is sufficient internet access)	(Bentley et al. 2016; Bello-Bravo and Pittendrigh 2018; Davito et al. 2017)
Suitability for audiences with low print literacy	(Bentley et al. 2016; Bello-Bravo and Pittendrigh 2018, 2019)
Capacity to foster knowledge sharing	(Bentley et al. 2016; Bello-Bravo and Pittendrigh 2018, 2019; Maredia et al. 2018).

Table 2. Recommendations for increasing the efficacy of videos for agricultural extension.

Recommendation for maximising the efficacy of extension videos	Reference(s)
Videos must be concise, i.e. long enough to convey useful information, but no longer than necessary	(Bliss et al. 2019; Fry et al. 2019; Thomas, Bowling, and Brewer 2018; Van Mele 2011; Wright et al. 2018)
Videos should feature farmers – farmers tend to trust information from those they perceive as role models	(Van Mele 2011; Van Campenhout, Spielman, and Lecoutere 2021)
Use appropriate language for the audience	(Dai, Tabirca, and Lenihan 2009; Karubanga et al. 2019; Fry and Thieme 2019)
Keep videos up to date	(Bliss et al. 2019)
Co-design videos where possible to elicit trust	(PLAID project 2017)
Show management in action	(PLAID project 2017; Fry and Thieme 2019)
Videos should be translated appropriately	(Fry et al. 2019)
Use high-quality video and audio	(PLAID project 2017)
Ensure videos are easily accessible	(PLAID project 2017)

way of exchanging information with farmers (see e.g. Fadairo and Oyelami 2019; Adamides and Stylianou 2018).

3. Conceptualisation: credibility, relevance, legitimacy and accessibility

In this paper, we use a modified conceptual framework first used by Cash et al. (2002, 2003) to explore ways of communicating at science and policy interfaces. This framework consists of three attributes: credibility, relevance and legitimacy (CRELE). Where these attributes are achieved to a threshold deemed sufficient by its audience, it is hypothesised that the information being conveyed will be taken seriously. The CRELE framework is a pertinent way of framing this study as previous studies on digital farm extension have addressed each component without explicitly using this framework. For example, existing recommendations for producing successful videos largely relate to credibility, relevance and legitimacy (Table 2).

For this paper, based on the findings of the literature review above, we define **credibility** as referring to the validity, accurateness, and quality of videos and podcasts.

Relevance, in this paper, refers to how salient a video/podcast is to a farmer's needs. Farmers are highly heterogeneous due to their differing interests and needs, thus what is deemed as relevant information will vary from farmer to farmer. Where a video is credible but fails to explain why it is important to the viewer, it is unlikely to result in views or retention. It was thought that farmers will begin assessing the relevance of the video as soon as they read the title or description, see the cover image, or watch the first 5–10 s. It is, therefore, expected that it is crucial to make these aspects of the video relevant alongside the content itself.

Here, **legitimacy** refers to the inclusion of farmers in the production of the video or podcast as well as the presentation of balanced views. Including farmers in the production process and building on their knowledge can increase trust in the information (Ingram and Morris 2007; Riley 2008; Ingram et al. 2016). Likewise, presenting complete knowledge of both positive and negative aspects related to the content that is being presented and being transparent about the information used increases legitimacy (Sarkki et al. 2015).

There was, however, a gap in the CRELE framework relating to the ability of farmers to locate and watch videos and podcasts. Similarly to Sarkki et al. (2015), who added 'iterativity' to the CRELE framework, this study adds an attribute to the CRELE framework

(forthwith referred to as CRELE+); 'accessibility'. This was added due to existing evidence which indicates that videos will only be used where they are easy to locate and watch (PLAID project 2017).

Accessibility in the context of videos and podcasts is defined as whether farmers perceive this content as easy to access, whether they can physically access the content and whether the content is accessible in terms of their knowledge requirements and learning preferences. Farmers may not believe videos and podcasts are accessible to them. Age and IT skills may play a role here and some farmers may not be able to access videos and podcasts due to lacking a sufficiently strong internet connection or due to not possessing the necessary equipment (e.g. smartphone, computer) (Philip et al. 2017). In addition, even where farmers can access videos, it is unlikely that they will be viewed by many where they are not distributed effectively. Threats to the physical accessibility of a video may include cases where an obscure title or genre is used, thus making them unlikely to appear in searches, or where the video/podcast creator does not share it widely enough (e.g. in subscriber emails or across social media) (Zhou et al. 2016; Bärtl 2018). Lastly, the use of accessible language and clear structuring of the content is likely to be a key element of accessibility.

As outlined by Cash et al. (2002), there are abstract thresholds that exist for each CRELE attribute. Where these 'thresholds' are met, it can be assumed that video content will be seen as worth watching by farmers. It is, however, important to note that overlaps, complementarities, and tensions exist between the four components of the framework. An overlap, in this context, exists where a particular theme meets the definition of more than one CRELE+ attribute. For example, where the content used in a video is well-trusted, this may increase its credibility, relevance, *and* legitimacy. Similarly, complementarities between the attributes exist where an attempt to increase one attribute (for example, credibility), increases another (for example, accessibility). Lastly, tensions may occur where an attempt to increase one attribute results in the loss of another. For example, filming a video of a local farmer may increase its relevance but could result in a loss of credibility if the featured farmer doesn't possess high social capital.

4. Methods

This study used a mixed-methods approach focusing on farmers in England, comprising an online survey, telephone interviews, and focus groups of farmers before the COVID pandemic (2018/2019), followed by an analysis of YouTube videos linked to the Agricology[1] website, another online survey and further focus groups during the COVID pandemic (2021). The aim of this approach was not explicitly to allow comparison between the two studies. Instead, the COVID pandemic offered an opportunity to consider further the role of digital extension methods at a time when farmers were likely to be using them more widely. Table 3 provides an overview of the methods carried out and more detail is provided in Appendix 1.

4.1. Online surveys

The platform used for the pre-COVID survey was Jisc Bristol Online Surveys (Jisc 2019). This was part of a wider study exploring the efficacy of advice surrounding diffuse water

Table 3. An overview of the methods used in this paper (see Appendix 1 for more detail).

Method	Sample size (n)	Dates
	Pre-COVID (2018/2019)	
Online survey	221	10/18-02/19
Telephone interviews	60	11/18-11/19
Focus groups (farmers)	26 (across 4 focus groups)	11/18-11/19
Mid-COVID (2020)		
Online survey	141	07/20-11/20
Video analysis	100	09/20
Focus groups	24 (across 4 focus groups)	11/20

There were originally 225 responses to the pre-COVID survey but 4 were removed due to inconsistencies.
One incomplete response to the mid-COVID survey was entered as a complete response by the survey software, but we included this in the analysis as some questions were completed.

pollution from agriculture (Chivers 2021). The survey included questions to gather insights into whether farmers were already watching informative videos and the extent to which watching more videos may be useful. The survey was promoted across social media and through a paid-for advertising campaign with Farmers Weekly (a farming magazine). The Farmers Weekly campaign consisted of a billboard on the website and an email sent directly to their ~30,000 subscribers.

The mid-COVID survey used the findings of the literature review and the pre-COVID survey to structure questions. The survey was hosted by Qualtrics and piloted by five farmers before being distributed. The survey was distributed online and through organisations connected with the project leads. Responses from a range of farm sizes, types, locations and age/genders were gathered (Appendix 1). One of the concerns with distributing the survey exclusively online (due to COVID restrictions) was the possibility of a biased sample. However, we found that 66% of our respondents watched videos to gain knowledge on farming practices, with just 42% using podcasts. Thus, our sample was not solely comprised of those who use videos and podcasts.

Both surveys held prize draws for participants who wished to enter. All surveys were anonymous and contact addresses for the prize draw were not linked with responses. Due to the recruitment strategies used, the resulting samples were not representative of the farming population in England. However, in combination with the other methods used here, they provide strong insights into the CRELE+ framework for videos and podcasts. Respondents were not always shown all of the same questions – for example, if respondents ticked that they did not use videos, they were routed away from questions delving further into videos, and likewise for podcasts. Responses for both surveys were analysed using SPSS statistics software (version 26), with qualitative answers analysed using NVivo 12 plus.

4.2. Telephone interviews

Pre-COVID telephone interviews were conducted in 2018/2019 with 60 English farmers as part of a wider study (Chivers 2021). The questions, similarly to the pre-COVID online survey, included an exploration into the potential of videos as a source of agricultural information. Farmers were recruited during various farm events (see appendix) where they were approached during the lunch break to ask whether they'd be interested in participating in the study. A broad range of farmer characteristics were represented by the telephone interviews (see Appendix 1).

4.3. Focus groups

Focus groups of farmers were carried out during both study periods. The pre-COVID focus groups were part of a wider study but the credibility and relevance of videos for gathering information and advice were included in the protocol. Pre-COVID focus groups were held in person whilst the mid-COVID focus groups were carried out online due to lockdown restrictions (Appendix 1).

The pre-COVID focus groups were carried out within four counties across England: Devon, Dorset, Cumbria, and North Yorkshire, with farmers recruited at local farming events hosted by advisory entities (e.g. Catchment Sensitive Farming). In total, 24 farmers for the mid-COVID focus groups were recruited from different regions of England, covering a range of farming enterprises, using the networks of Agricology (a networking organisation). These were conducted via Zoom and lasted up to 90 min. Farmers were given £100 to cover their time, which included answering three questions beforehand to help us understand the range of views amongst participants before conducting the focus group. Though online focus groups were not the first choice of method given their potential to bias the sample towards those farmers who were comfortable with online technologies, there was no other choice as agricultural shows and other events did not run due to lockdown restrictions. However, focus group participants were not all avid users of videos or podcasts; whilst most participants stated they watch videos, not all of them did so regularly. In addition, just half of the focus group participants had listened to podcasts (Appendix 1). The focus groups were recorded, transcribed, and analysed thematically using NVivo 12 plus.

4.4. Analytics of YouTube video views

YouTube is the main platform used by Agricology for uploading and distributing videos. Our analysis used YouTube data from 100 of the 311 videos uploaded to the Agricology channel from its conception in November 2015 until June 2020. The data were extracted out of the top 200 videos by views, as this was the greatest number available on YouTube when filtered by views. Of these 200 videos, the top and bottom 50 videos by views were analysed, leaving a sample of 100 videos. Data were extracted from the YouTube channel analytics which details engagement and audience. Podcasts have recently been added to the channel but were not analysed for this paper because they were too recent to provide indicative analytics.

4.5. Ethical approval

The pre-COVID (2018/2019) research methods were approved by the University of Exeter's ethics committee whilst the mid-COVID (2020) research methods were approved by the University of Reading's ethics committee. The authors were compliant with the latest GDPR legislation.

5. Results

5.1. Current use of videos and podcasts

A total of 220 farmers answered questions about videos during the pre-COVID online survey. Three-quarters (75%, $n = 165$) of these participants stated that they have

watched videos to gain information about farming. Meanwhile, during the COVID pandemic, over half (66%) of survey participants stated that they used videos to gain knowledge on farming practices, with three-quarters (75.6%) of these respondents claiming that their use of videos had increased since the COVID pandemic. None of them indicated a decrease.

In the pre-COVID online survey and telephone interviews, participants were asked whether they would find it useful to have more advisory videos available to them. Over half of online survey respondents (63%, $n = 137$) said yes, whilst just 15% ($n = 33$) said no. Similarly, over half (60%, $n = 36$) of telephone interviewees believed that videos could offer a useful tool for providing extension. In addition, as detailed in the following sections of this paper, most of the pre-COVID telephone interviewees who already watch videos (20%, $n = 12$) expressed positive sentiments towards them.

The use of podcasts was only explored by the mid-COVID study. Of the survey participants, those farmers who listened to podcasts were asked how their listening levels had changed since the COVID pandemic. Over half (61%) of the 56 farmers who had already indicated that they've listened to podcasts, and answered the question, said that they were listening to podcasts more since the pandemic. Just 2% stated that there had been a decrease.

5.1.1. The credibility of videos and podcasts

In the mid-COVID online survey, farmers were asked about their preferred methods for gaining knowledge on farming practices. Figure 1 displays the percentage of farmers who chose each method. Reading (paper or online) was the most popular method used to gain knowledge on farming practices (89%, $n = 141$). In addition, face-to-face methods such as talking to other farmers, advisers, or demonstration events/workshops were also important (all adopted by over 70% of respondents). This suggests that videos and podcasts may not currently be seen as possessing as much credibility as these other approaches.

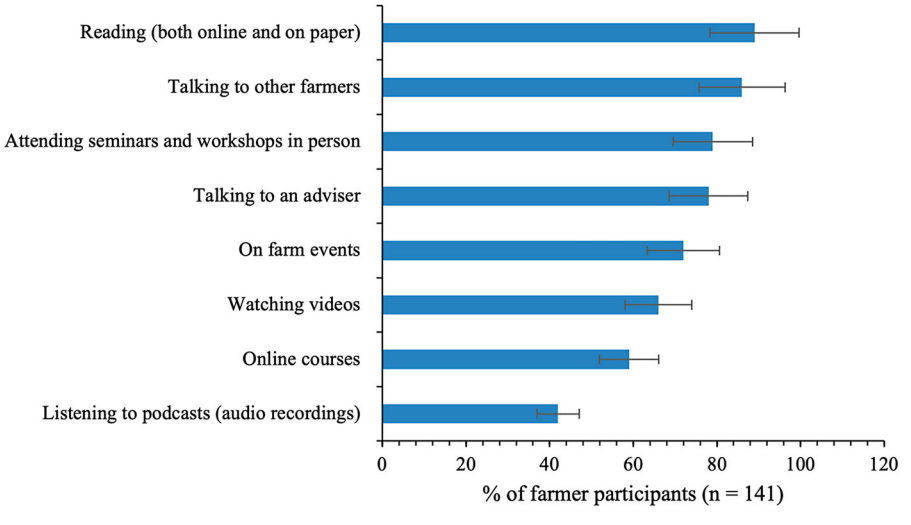

Figure 1. Farmers' responses to the question 'Which methods do you use to gain knowledge on farming practices?' ($n = 141$) in the mid-COVID online survey.

In the mid-COVID survey, farmers were asked about the effectiveness of videos in terms of their ability to drive practice. Of the 90 respondents who already watch videos and responded to this question, most said they were likely (extremely likely = 21.1%; somewhat likely = 56.7%) to implement a practice they had learned by watching a video. This suggests that videos are a credible approach for encouraging behaviour change. In addition, videos appear to result in learning; for example, one pre-COVID telephone interviewee stated: *I've learnt more off YouTube than I've ever learnt off anyone else!*

Some farmers were, however, sceptical of videos, in part due to reminiscing about the previous advisory system in the UK and a preference for books: *[People] simply look online [but] there's all this research done in the 60s and 70s, all government-funded, impartial, but no-one uses it, it's just gathering dust in libraries. A lot of these old guys were geniuses.* (Focus group, pre-COVID)

The quality of the video presentation was an important determinant of credibility. Farmers argued that videos should include well thought out content, be clear from the outset, be filmed so that it is not shaky or blurred, and comprise good quality images and audio. One farmer said:

> 'Sound quality is really important. You see a lot of farmers on videos where suddenly you have wind noise and you can't understand a word they're saying. If out in a field, if needed, voice it over and edit afterwards, keeping an eye on wind levels.' (Focus group, mid-COVID)

The quality of the information was also seen as important with one farmer saying that videos could be the source of 'valuable advice' if delivered by effective communicators:

> 'Some people can provide fantastic valuable advice. Sometimes some of the most interesting videos are coming from very good communicators who can spell stuff out really clearly. I find you can get really useful feedback off the back of a discussion of a video posted on Twitter. There are some really effective communicators and they are sharing what they are doing and [it's] really interesting to pay attention to that.' (Focus group, mid-COVID)

One farmer in the mid-COVID survey felt that videos were *too impersonal and therefore lack credibility*, perhaps hinting that face-to-face methods of delivery were better in this respect. Another said that they would start to use videos more if the '*quality of the content*' was better (mid-COVID survey).

The triangulated results indicate that farmers view videos as broadly credible where they meet a few key requirements (Figure 2). These requirements include that they should contain believable information, are delivered by a well-known presenter or entity, and that the content consists of practical information which is feasible in real-life situations. The need for practical information relates to both credibility (by making it more believable) and relevance (as practical information is more likely to be applicable on-farm).

Figure 1 illustrated that the use of podcasts was seen as the least popular method of learning out of the eight options presented. However, in our mid-COVID survey, 73.3% of respondents who do listen to podcasts (n=56) said that they were extremely likely (17.9%) or somewhat likely (55.4%) to implement a practice that had been discussed in a podcast. This suggests that podcasts could be an effective form of extension. Below, a farmer gave an example of how a podcast had influenced their practice:

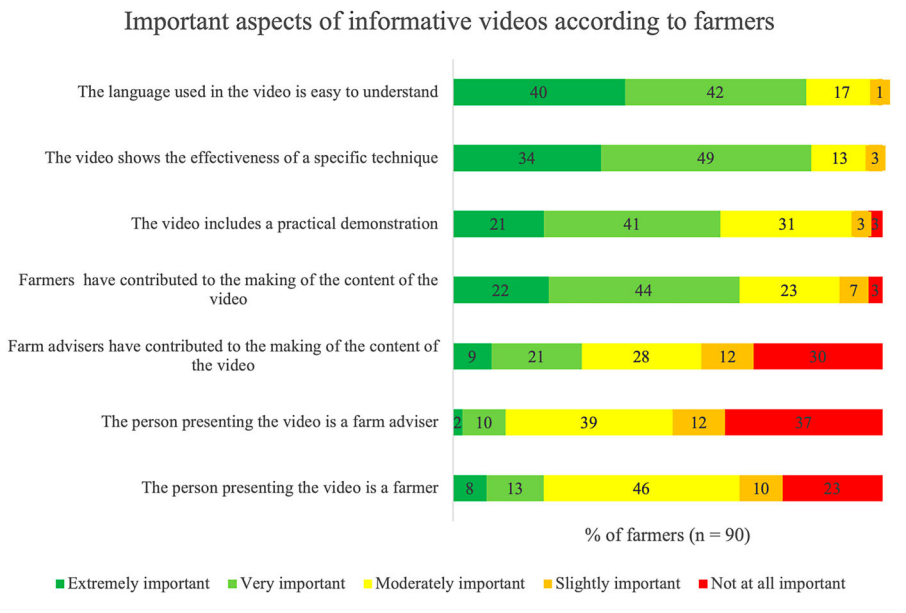

Figure 2. Important aspects of informative videos according to mid-COVID survey participants (n = 90).

> 'One particular podcast gave me the confidence to stop using pesticides which felt like a gamble at the time. It gave me the confidence to carry on. But I haven't done something directly because of a podcast.' (mid-Covid focus group)

The credibility of information was not always the reason for listening to podcasts; some farmers talked about how they used podcasts for entertainment, rather than necessarily to help them with how to perform a new practice. Farmers said:

> 'I don't listen to farming podcasts for information about technical info, they are uplifting, I'm not listening to learn what's the best rotation to do in the spring, it's not a good format for technical information, more for stories and a bit of emotion.' (mid-Covid focus group)

> 'You listen to someone's opinion, views or a discussion. Not to gain technical knowledge. More listening to a person because you want to hear what they've got to say.' (mid-Covid focus group)

This is not to say, however, that some farmers did not use podcasts to help them gain knowledge, and if so, the information needed to be credible.

> 'I think there are a couple of good technical ones. The New Zealand beef and lamb podcast goes deep into particular topics. Some have been some of the most useful information I got [from any source]. One I really like is the pasture pod, [as it] has good technical stuff and [they] interview really good farmers. I got a lot out of both of those. I just want facts.' (mid-Covid focus group)

As with videos, the quality of the recording was important for credibility. One farmer in the mid-COVID survey said that *audio quality is very important. I switch off if the audio quality isn't good.*

5.1.2. The relevance of videos and podcasts

Alongside showing practical demonstrations, farmers stated that videos should demonstrate the effectiveness of farming techniques if they are to achieve relevance. Several open-ended comments made within the mid-COVID survey referred directly to the relevance of videos, with one farmer stating that they would watch videos *covering topics that are relevant … and thought provoking*. A remark from pre-COVID focus groups illustrated that videos would not be watched if they weren't considered relevant for a specific issue:

> 'Yeah, I mean potentially but it would be a case of needing … because it's so issue-specific, so you know you're not just gonna sit down and watch a video just out of interest, it would have to be, right this is for this issue, this is for a specific constraint I've got, what's the advice?' (Focus group, pre-COVID).

As with other forms of gaining information, farmers said that they would be reluctant to watch material that was not wholly relevant to their farm. This would include videos that contain relevant content amongst chunks of content less relevant to others. This indicates the need for time headings within videos; as one farmer said:

> 'For me, that's where the written word [is better]. I look at the 60-page document, I can see headlines whether it's A B and C and I can skip from that and go where I want to and miss the introduction or whatever. I struggle to see how the video can do that without watching the first 3 min.' (Focus group, mid-COVID)

Several telephone interview participants ($n = 17$) provided caveats to videos becoming useful, most of which related to the relevance of their content ($n = 13$).

A key aspect of relevance that arose was that the information in videos should be practical. One comment in the first round of surveys said that *watching other people doing things is good because you can see if it will work or not with your own system.* The following comment also illustrates this narrative:

> 'I was watching a video today on roller crimpers for finishing off cover crops – I defy anybody reading a book about roller crimping and get as much as I got it in 2 min watching a video seeing a tractor pull one 20m. You go 'oh ok, that's how it works'.' (Focus group, mid-COVID)

The visualisation offered by a video could take information and present it in a relevant way for farmers, showing them how to implement something in practice, which the written word could not do as easily.

The relevance of podcasts was also identified as important from the mid-COVID survey and focus groups. Participants mentioned that the relevance of a podcast to their farm was an important determinant of whether they listened to it. Farmers would quickly stop listening to a podcast if there was *no relevant content* and some commented that they were *often not relevant, too long* (focus groups). One aspect of relevance, the ability of a podcast to discuss the effectiveness of a technique, was highly ranked in the survey (Figure 3).

5.1.3. The legitimacy of videos and podcasts

Figure 2 suggests that having a trusted person (e.g. farmer/advisor) delivering videos is less important than other factors. Meanwhile, farmers having the opportunity to

contribute during the production of videos was ranked as highly important. Trustworthiness was frequently commented upon in the focus groups as a measure of whether or not farmers would watch and listen to a specific video. Firstly, one farmer argued that videos would be seen as more trustworthy if fellow farmers were involved in the video, for example by presenting the information:

> 'These things are more powerful when farmers are doing it. The farmers have more time to listen to other farmers than they do to researchers or politicians etc. If you have a video of a couple of farmers discussing how they've implemented an option, how does it work, what works or not. […]' (Focus group, mid-COVID)

Other farmers extended this point and spoke about the need for a video to take a balanced approach and not just present a one-sided positive view of implementing a practice.

> 'An honest appraisal of pros and cons – not just good bits. Great to hear the downsides which are more believable. Three times as helpful as just the good bits.' (Focus group, mid-COVID)

Other farmers displayed some frustration with videos that contained adverts for companies or those that appeared biased towards selling products. Indeed, one farmer said that they *prefer face-to-face* because they get a *better idea if the person is talking shit* (Focus group, mid-COVID) if they can look them in the eye.

These comments suggest that trustworthiness, honesty, and a balanced approach are key hallmarks of good videos and are essential to their perceived legitimacy. Including farmers in the making of the video may contribute to these aspects.

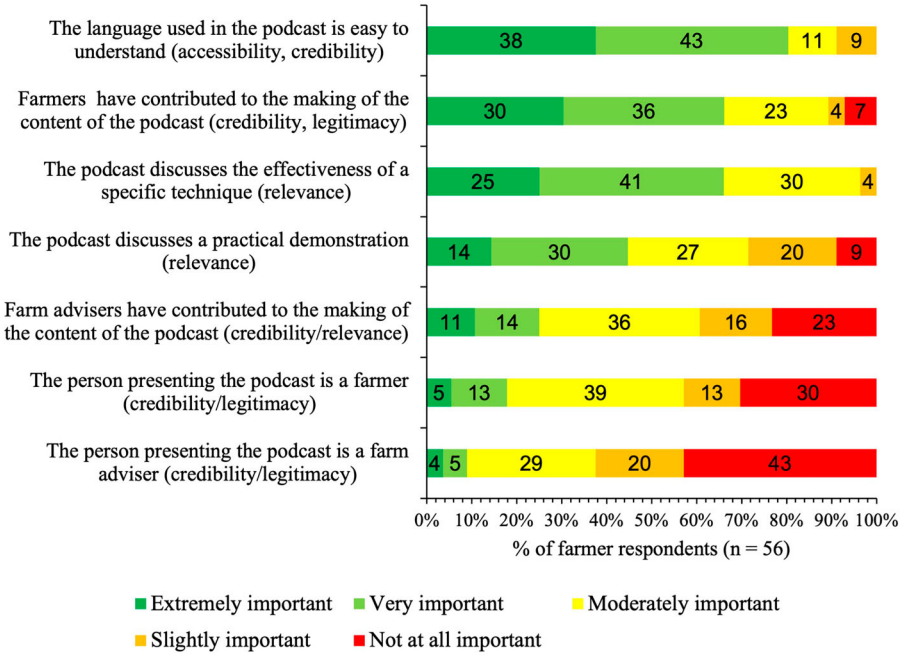

Figure 3. Ranking of important factors for watching podcasts.

In a similar vein to videos, farmers spoke about the importance of presenting a balanced view in podcasts. One farmer in the focus group commented that:

> 'A podcast has to be brave enough and mention the negatives. It doesn't have to be bad but discussing both good and bad things. People may trust it more.'

Furthermore, Figure 3 demonstrates that farmers contributing to the making of a podcast was considered important by survey respondents. This suggests that legitimacy is a key component of podcasts, although perhaps this is less important if some farmers are using podcasts as a source of entertainment.

5.1.4. The perceived accessibility of videos and podcasts

A significant positive to watching videos was that knowledge could be gained from places that a farmer could not physically attend. In the mid-COVID focus groups, farmers highlighted a key drawback of in-person events that could be addressed through the use of online videos. Many raised the problem of travelling long distances to access in-person events, the cost of fuel, the loss of time, which meant that many events became inaccessible. These problems are exacerbated if the event is not of good quality and the pandemic had made some farmers question the trade-offs between attending events as opposed to remaining at work. One farmer said:

> 'You might get up early, travel two hours to an event and then you find it's not what they said it's going to be and you've wasted a day completely just due to write up being incorrect - quite often it's because it just isn't innovative enough.' (Focus group, mid-COVID)

Videos were seen as a potential way of saving time and money and of making events more accessible, though in some cases watching online streams of on-farm events had not been considered before the COVID pandemic. One farmer said that:

> 'I joined a couple of virtual farm walks during lockdown, one was organic farming - which was fab. Wasn't sure what to expect. The prospect of me driving far, I wouldn't have done it. That was really good. I logged in. It was just 45 min between other jobs – could go back to it later. It was really really good. It's a shame they don't do that more. I found that really useful.' (Focus group, mid-COVID)

In fact, not relying on face-to-face methods of learning could also increase the possibility of sharing lessons globally.

> 'Actually, it's been a positive thing – we have more members than before, we've been able to access a lot of the bigger name speakers that might have been expensive (e.g. fly to the UK, stick in a hotel - international) It's been very simple to get their knowledge in front of a number of farmers.'

> 'You can grab 5 min and you can learn about how to grow cherries regeneratively in the US – things you wouldn't have been able to access previously – I see that as hugely positive.' (both from mid-COVID focus groups)

The ability to access videos on-demand, at no cost, watching it multiple times, whilst stopping and starting it at any time was seen as valuable. One farmer said in a focus group (mid-COVID) that *you can go back and watch it again which is another beauty of these things. You can watch it repeatedly if you didn't get it the first time.*

The understandability of language was the top-ranked factor for videos and podcasts (Figures 2 and 3). Mid-COVID survey participants were asked to rank aspects of videos and podcasts from most to least important. The understandability of language used was the top-ranked factor in both cases (see Figures 2 and 3). This has profound implications for the 'accessibility' attribute of CRELE+.

Length also appears to play a key role in accessibility according to the analysis of existing Agricology videos ($n = 100$) and the mid-COVID survey. The average duration of the Agricology videos was 6.40 min, of which the average watch time was 3.30 min (44% of the video duration). Of the shorter videos analysed ($n = 26$, average duration of 3.20 min), viewers watched a higher proportion of the total duration (60%-78%), with an average watch time of 2.00 min. For the top 50 videos by views, the videos had an average length of 6.30 min and an average retention rate of 54%. The bottom 50 videos had a longer than average video length of 30.09 min and although audience retention was lower, at 33%, the average watch duration was also longer at 13.30 min. These results suggest that shorter videos tend to have a higher number of views and a higher viewer retention rate. This aligns with a finding from the mid-COVID survey, where respondents stated that the average ideal length of a video is 5–10 min (Figure 4).

This was backed up by comments in the pre-COVID focus groups, including:

> 'The videos that I watch are […] to the point. And then if you want to learn more, if there are enough comments and interaction they do sometimes bring out another video for people that want to go more in-depth. Any content needs to be to the point, the bits you don't need to know need to stay away from the video. Needs to be short and snappy.' (Focus group, pre-COVID)

According to the mid-COVID survey participants ($n = 56$), the ideal length of a podcast is substantially longer than a video, with 59% of respondents stating that they could be 20

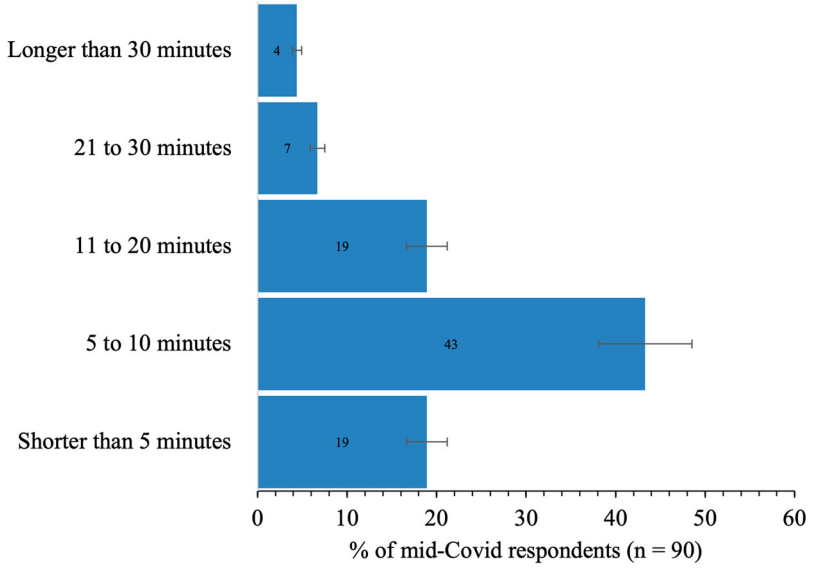

Figure 4. The ideal duration of informative videos according to mid-COVID survey respondents ($n = 90$). 7 (8%) responses for 'not sure' are excluded from the graph.

min or longer (Figure 5). This indicates that podcasts are better placed than videos for conveying complex topics as farmers are willing to engage with them for longer. This is likely because podcasts are more flexible than videos as they can be listened to whilst undertaking tasks on-farm.

When compared against other extension approaches, however, survey and interview participants suggested that in-person, face-to-face events were most effective. The visual benefits of face-to-face learning and demonstration events were stressed at length. In addition, the opportunity for interactivity, such as asking questions, was highlighted as a benefit that videos could rarely provide. One farmer relayed the importance of being able to have *side conversations* at in-person events:

> 'You go to a meeting the topic might not be as interesting, but you usually come away having learnt something even if not to do with the topic in hand – it's that interaction with other people who were there and who were interested in the same sort of thing.' (Focus group, second phase)

Similarly, another farmer insisted that on-farm meetings are far more effective than other extension techniques:

> 'The best way of learning is on farm or a small meeting you learn more about a subject by speaking to people who are attending. I don't think anything will ever beat an on-farm meeting.' (Focus group, second phase)

Other major barriers to using videos discussed in the mid-COVID survey and focus groups included a lack of time to find them, not knowing where to find good videos, and limited internet connectivity. Indeed, most of the 32 negative views shared by pre-COVID survey participants related to difficulties when accessing video content. Just one farmer in open-ended survey respondents referred to age as a barrier, but there was some discussion in the first focus groups about this factor. Six participants

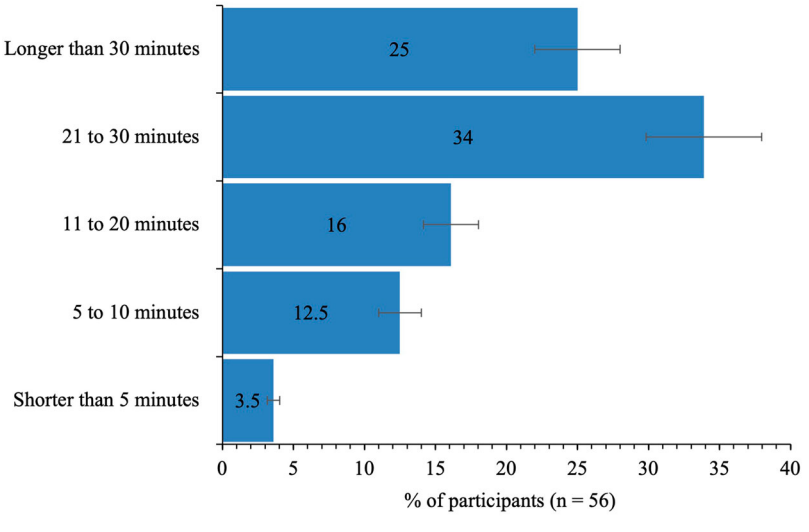

Figure 5. Ideal duration of podcasts according to mid-COVID online survey participants. 5 (9%) responses for 'not sure' are excluded from the graph.

in the first focus groups referred to age: *If it's online I'm not gonna see it because I'm 52, I'm not gonna go … I'd probably end up with some dodgy video instead (laughs) with my online skills, so if it's as a standalone thing, probably not* (focus groups, pre-COVID). In addition, three telephone interviewees referred to time constraints as preventing them from accessing video content. However, most farmers who referred to accessibility in this way did so positively, stating that videos offer flexibility in terms of when and where they are watched; *Easy to access and view, especially when sitting on the loo.*

From the mid-COVID survey, 84% of farmers said that their internet connection allowed them to easily access videos, meaning 16% had difficulty accessing videos (noting the caveat that this was an online sample so this could underestimate the impacts of insufficient internet connections). The following conversation in a pre-COVID focus group also spoke of internet connectivity:

> Farmer 1: We struggle here with our connection …
>
> Farmer 2: Yeah but then I couldn't survive without me phone! I'll be fair!
>
> Farmer 3: I'm getting better and better at it
>
> Farmer 2: I wouldn't survive without that. and we do have 4G around here now" (Focus groups, first phase)

As with videos, the use of clear language in a podcast was the top-ranked factor out of options given in the mid-COVID survey (Figure 3). The ability to multi-task on a busy farm was seen as a key hallmark that makes podcasts an accessible form of learning. The main reason for using podcasts from both the survey and focus groups was the ability to multi-task whilst listening; for example, podcasts can be listened to whilst doing other jobs, including driving as they do not demand undivided attention. In addition, they are often entertaining. A quote from a farmer in the focus group summarised this point:

> 'I really enjoy podcasts primarily because I drive a lot. It's a great way to kill the boredom of driving and learn. It signposts me to verify what I hear with either advisers, peers or colleagues'

Almost 80% of survey respondents agreed that their internet connection will allow them to listen to podcasts, suggesting that up to 20% of farmers might struggle to access them (caveat of an online sample which could underestimate this figure). In reality, this may be lower as podcasts are designed to download slowly where internet connections are weak.

The most striking theme from both the survey and focus groups was the number of farmers who did not know what a podcast was. In turn, this unfamiliarity could have affected their ability to confirm if their internet connection could facilitate one. There were at least twenty separate comments along the lines of *don't know what a podcast is* or *never heard of a podcast*. Several farmers knew what a podcast was, but did not know where to find good ones. One farmer said:

> 'I haven't used any podcast yet, but I'd really like to. I don't know how you go about finding where the interesting content is. I spend a lot of time sat on a woodchipper, not moving. I quite like to be learning in that time and making better use of it, but I don't know where you find the interesting content.' (Mid-COVID focus group)

This indicates that if podcasts are to become a mainstream source of information for farmers, efforts to raise farmer awareness of their existence and utility, as well as where to find them, will be key.

Quality of presentation was considered a key factor in the focus groups, particularly in terms of how entertaining a podcast was. One farmer said:

> 'It's down to the person you are listening to. If you use a podcast to put information out there, just have a good presenter that is good at presenting the show.' (Mid-COVID focus group)

In a similar vein to videos, some farmers criticised podcasts because of the time and concentration needed to listen to them (podcasts can be longer than videos), as well as poor connectivity.

5. Discussion

Figure 6 presents how the CRELE+ framework has been applied here and demonstrates the overlap between attributes; for example, the use of simple language is important for achieving both accessibility and credibility. With the addition of accessibility, the CRELE + framework helps us to understand key components of good videos and podcasts for farm extension. Many of our results validate findings from previous studies that videos can be an effective method. For example, our results suggest that videos can be seen as credible if they are filmed to a high quality and contain valid and trusted information (Bello-Bravo and Pittendrigh 2018; Maredia et al. 2018; Thomas, Bowling, and Brewer 2018). The relevance and accessibility of videos, such as their ability to visualise management practices, low cost and flexibility to access were also similar in our study to previous research (Van Mele 2011; PLAID project; Zossou et al. 2009), as were key characteristics of accessible videos: such as length and clear language (Bliss et al. 2019; Van Campenhout, Spielman, and Lecoutere 2021; Fry and Thieme 2019; Fry et al. 2019; Thomas, Bowling, and Brewer 2018; Wright et al. 2018). Our results suggest that involving farmers when producing videos can also be important for increasing legitimacy.

The use of podcasts for farm extension has not been widely discussed in the literature. On the role of podcasts, our study suggested that many farmers in England do not know what podcasts are or where to find them, and use them less than other forms of learning, for example, because they lack visualisation. However, some farmers enjoy listening to podcasts as a form of entertainment. Furthermore, the accessibility of listening to podcasts whilst performing other tasks, such as driving the tractor or performing other work, is an advantage of a podcast over other forms of learning that require undivided attention. Extensionists may consider using podcasts alongside other forms of learning since farmers may be able to absorb a good deal of detailed information whilst listening to podcasts around the farm. Many of the same attractive characteristics of videos apply to podcasts in terms of credibility, relevance, and legitimacy – using high-quality information and production, and relevant information with trusted actors having input to it. However, podcasts can be longer and more detailed than a video, which allows different forms of information to be presented, again linked to how farmers engage with this type of learning (whilst doing other things).

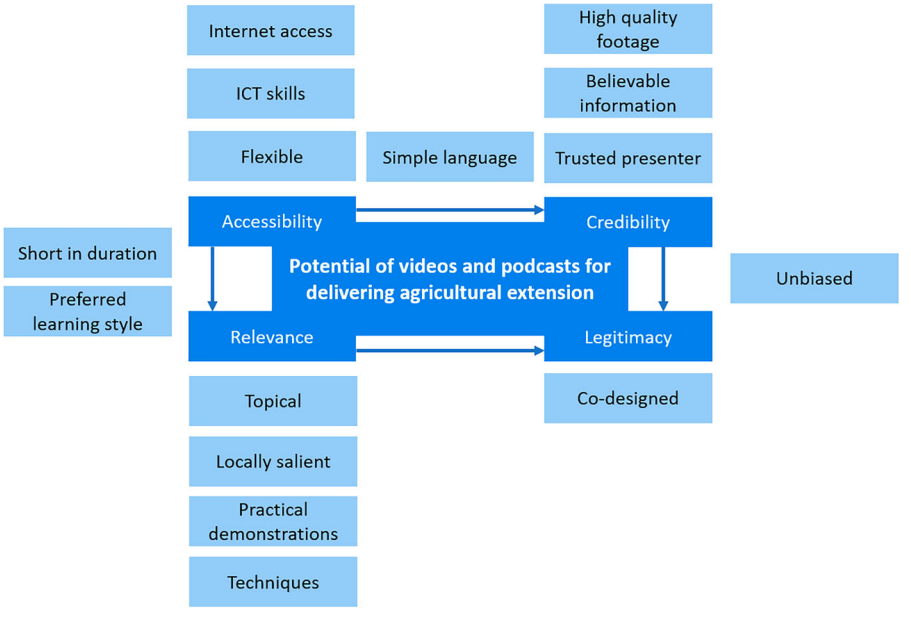

Figure 6. Schematic diagram illustrating how the factors identified within this paper map onto the CRELE+ conceptual framework. Factors placed between attributes demonstrate the presence of overlaps; for example, videos and podcasts must be unbiased if they are to achieve both credibility and legitimacy.

There was less discussion of podcasts in the focus groups because participants were more interested in talking about videos. However, many of the same hallmarks of a good video, in terms of credibility, relevance, legitimacy, and accessibility were used by farmers when discussing podcasts. The difference between the use of podcasts as opposed to videos is mainly in the area of accessibility, with podcasts offering greater flexibility for when and where farmers could engage with content.

Though there is much literature on the value of videos in farm extension, the fact that we undertook part of our fieldwork during the COVID pandemic means that we are uniquely positioned to consider the trade-offs of using videos and podcasts vis-à-vis other extension methods. There is a limited explicit discussion of such trade-offs in the existing literature. Table 4 provides our reflection on the trade-offs explored in our study between digital and face-to-face methods of extension. The barriers and enablers of non-digital approaches were identified through existing literature and the empirical findings of this research for videos and podcasts.

Whilst we know that farmers tend to prefer face-to-face styles of learning (Ingram et al. 2018), a point reinforced by Table 4, the pandemic has encouraged both farmers and extensionists to re-evaluate how knowledge can be exchanged. In our study, farmers noted how they had been able to engage with information nationally and internationally, which could never be gained from travelling to local in-person events. They also spoke widely about how the ability to access virtual farm walks and videos of events online had freed up some of their time and saved costs, as they did not have to travel long distances to access in-person events. Their use of videos and podcasts had overwhelmingly increased since the pandemic.

Table 4. Trade-offs between different extension approaches.

	Credibility	Relevance	Legitimacy	Accessibility
Videos	Can be credible if the information in it is accurate and trusted (+) Can be credible if filmed to a high quality (+) Limited trust from lack of face-to-face contact (-)	Can be highly topical when produced regularly (+) Visual, practical learning can be effective (+) Unable to be personalised for individual farms (-)	Trusted farmers and advisors can be involved in the video (+) Not interactive (-)	Can be accessed remotely (+) Can be disseminated far and wide, re-watched, and low cost (+) International knowledge gained (+) Can be effective is language is clear (+) Internet connection issues, digital skills (-) Not knowing where to find them (-)
Podcasts	Can be credible if the information in it is accurate and trusted (+) Can be credible if recorded to a high quality (+) Limited trust from lack of face-to-face contact (-)	Can be highly topical when produced regularly (+) Unable to be personalised for individual farms (-)	Trusted farmers and advisers can be involved in the podcast (+) Not interactive (-)	Can be accessed remotely (+) Can be listened to whilst undertaking other tasks (+) International knowledge gained (+) Can be effective is language is clear (+) Internet connection issues, digital skills (-) Not knowing where to find them (-)
In-person (1:1)	Often delivered by a trusted advisor and face-to-face contact seen as credible (+)	Highly personalised delivery (+)	Can be highly interactive (+)	Advisor visits the farm (+) Cost associated with delivery means that engagement is unlikely to be frequent (-)
In-person (group meetings, e.g. farm walks)	Often delivered by a trusted advisor or peer and face-to-face contact seen as credible (+) Side conversations with peers at events is helpful (+)	Can take place on farmer's own farm or a local farm, which makes it highly relevant for the individual farmer (+)	Can be highly interactive (+) Fosters peer-to-peer learning (+) Can revert to top-down delivery (-)	May require travel to attend, time and resources (-) More focused on place-based not international learning (-)

Note: Green boxes represent a successful approach for an individual strand of CRELE+, red is used where the approach is unlikely to reach the threshold for a specific CRELE+ attribute, and orange represents mixed efficacy.

Drawbacks of videos, as compared to on-farm events, were that interactivity was limited, including the serendipity of learning which often occurred from spontaneous conversations with people attending those events. Such findings enable us to consider the trade-offs of different forms of extension. Ideally, digital forms of extension, such as videos, should be used in combination with face-to-face extension, as there are clear benefits associated with both. However, in the absence of being able to deliver face-to-face extension, videos could be a way to recreate the positive aspects of on-farm events where possible; for example, having a monitored comment section where farmers could ask questions and receive responses. Our findings indicate that some farmers are unable or unwilling to use videos and podcasts to learn about farming practices; as a result of attitudes, poor internet connections or lack of awareness of where to

find them. Therefore, as extension strategies rely increasingly on digital methods (Steinke et al. 2019; Fielke, Taylor, and Jakku 2020), there is a risk that those farmers suffering from a digital divide are further prevented from accessing good quality extension. This is a risk that should not be underestimated and shows the value of investing in skills and infrastructure, as well as providing non-digital options. Hybrid forms of extension, mixing face-to-face and digital options, are increasingly likely and can be tailored according to the needs and preferences of the intended audience.

6. Conclusion

This paper has made two key contributions: one is empirical and policy-relevant, the other makes a theoretical contribution through iterating the existing CRELE concept and successfully applying the resulting CRELE+ framework (see Figure 6). Our findings provide practical guidance to policy-makers and extensionists about how they can design and deliver video or podcast learning that replicates, as far as possible, the benefits of face-to-face learning. The primary message is that, where possible, videos and podcasts should be used in conjunction with other extension methods as they can lack a personal touch (Karubanga et al. 2019; Klerkx and Proctor 2013). Whilst videos and podcasts should not replace existing extension approaches, they offer the potential to become an increasingly used instrument in advisors' toolkits alongside more traditional approaches in hybridised extension approaches.

In terms of its theoretical contribution, we illustrate how adding 'accessibility' to the existing CRELE framework (Cash et al. 2002) makes it a robust framework to apply in the context of farm extension methods. Future research should seek to adopt this framework to determine whether this approach is a sufficient way of exploring the efficacy of other extension tools. In addition, the framework could be utilised by academics working in other subject areas due to its inherent flexibility.

Empirically, this paper demonstrates that videos and podcasts can be considered credible, relevant, legitimate, and accessible methods of farm extension. Digital extension can be adopted in many settings, including across several countries (including within the developing world, as demonstrated by Bello-Bravo et al. 2019). According to our findings, the main benefit offered by videos and podcasts is that they may be more accessible than in-person events for some farmers, particularly those with strong internet connections and technical know-how. Secondly, they allow farmers to take a targeted approach to quickly source relevant content and easily disregard immaterial content without sacrificing time and money. In addition, videos and podcasts may offer policymakers a cost-effective way of delivering simple communications, for example, to raise awareness about the farming rules for water (Defra 2017). The presence of positives and negatives across all extension methods discussed in this study reiterates the need for a flexible, multi-faceted approach to extension delivery. This is, therefore, important for policymakers and extensionists to consider as we transition towards offering hybridised advice (i.e. both digital and in-person) as a result of COVID lockdowns lifting.

Many of the lessons on what constitutes CRELE+ extension can be applied to non-digital methods. In certain contexts, perhaps in developing countries with weaker digital infrastructure, skills, and capacity for farmers to adopt digital devices, face-to-face extension may be more practical. In areas where digital skills, access, and

infrastructure are weak, some of the lessons on credible, relevant, legitimate, and accessible extension could be applied to the delivery of advice through radio programmes or CD/DVD provision, which are tried-and-tested methods in some places (Fadairo and Oyelami 2019; Adamides and Stylianou 2018).

Further research is, however, needed to further explore the trade-offs articulated above, including which groups of farmers respond well or badly to digital forms of extension for reasons of access, skills, infrastructure, or other reasons. Further research on how hybrid extension can be carried out effectively and in a complementary way, for example how videos and podcasts can be used alongside face-to-face approaches, is also required.

Note

1. Agricology is part of the Organic Research Centre in England and is a free online platform that shares practical information to support farmers and growers to transition to more sustainable, agroecological farming systems.

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Notes on contributors

Dr Charlotte-Anne Chivers is a research assistant at the Countryside and Community Research Institute (Gloucestershire) and recently completed her PhD at the University of Exeter. She has a background in both social and natural sciences and holds a BSc in zoology from the University of Reading. She is involved in several ongoing projects, including the EU-funded SoilCare and SPRINT projects and a farmer behaviour change project for the AHDB. She has also been involved in several other projects, including an NFU ELMs survey and Landwise. Her research interests include agricultural extension, ways of increasing agri-environmental behaviour, soil health and water quality, and the potential of future policy for achieving environmental goals.

Dr David Christian Rose is the Elizabeth Creak Associate Professor of Agricultural Innovation and Extension at the University of Reading and leads the Change in Agriculture group. He received his Bachelors (first-class) in Geography from the University of Cambridge, followed by a Masters in Geographical Research and a PhD (Geography) from the same university. He was Director of Studies in Geography at Gonville and Caius College (2015-17). After short post-docs at Cambridge and UCL, he took a Lectureship position in Human Geography at the UEA. He joined Reading in October 2019. His academic interests centre around the social impacts of agriculture 4.0, including extension, behaviour change, user-centred design and the ethics of new technologies. He is a Fellow of the Higher Education Academy and co-Director of the Centre for Effective Innovation in Agriculture.

Katie Bliss is an Agroecologist at the Organic Research Centre. She received a Bachelors (first-class) in Geography, Environment and Development at the University of Sussex followed by Masters of Science in Agroecology at NMBU (Norway) and Wageningen University and Research (Netherlands). Her work focuses on farmer led research and innovation, with a particular focus on crop diversification and intercropping. Previous roles include working with Bioversity

International developing participatory methods for analysing and designing diverse cropping systems. Working with individuals from across the sector she has helped to establish and develop the Agricology network of farmers and researchers sharing knowledge and experience with agroecology. She also works with her family farm in Cambridgeshire.

Auvikki de Boon is a PhD student, supervised by Dr. David Rose (Reading) and Prof. Camilla Sandström (Umeå University, SE). She holds a B.A. in Political Science, Sociology, and History from the Rheinische Friedrich-Wilhelms Univeristy of Bonn, and a M.Sc. in Political Science from Umeå University. Before joining the Change in Agriculture group, Auvikki worked as a research assistant at Umeå University. Her research interests include the governance of agricultural sustainability transitions, collaborative environmental governance, policy analysis, stakeholder participation, and climate change adaptation.

Lydia Lishman is the Project Manager for Agricology. She received a BSc Hons Geography and MSc Carbon Management at the University of Edinburgh. She works with the Agricology project which aims to support all farmers and growers to transition to farming systems based on agroecological principles and practices to enhance the sustainability, resilience and efficiency of their farming business.

Juliette Schillings is a PhD student, supervised by Dr David Rose and Prof. Richard Bennett (Reading). She holds a BSc in Biomedical Sciences from the University of Paris Descartes and an MSc in Process and Engineering in Food and Environmental Sciences. Finally, she studied an MSc in Applied Animal Behaviour and Animal Welfare at the University of Edinburgh. Juliette worked as a scientific information officer at the Farm Animals department from the animal welfare charity RSPCA prior to joining the Change in Agriculture group. Her research interests include animal welfare, animal behaviour and the ethics of Precision Livestock Farming technologies.

Dr Rachel Smith is an experimental psychologist who joined the Change in Agriculture group at Reading as a Research Assistant working on a farmer behaviour change project for Defra. She received a BSc (Hons) in Psychology from the University of Liverpool and obtained her PhD on the implicit and explicit effects of unhealthy food marketing, with a public health perspective, from the University of Wollongong, Australia. She is currently a Postdoctoral Researcher in consumer and sensory science at the University of Reading. Her academic interests include food choice, consumer behaviour, sensory science and new product development.

ORCID

Charlotte-Anne Chivers http://orcid.org/0000-0003-3267-5558
Katie Bliss http://orcid.org/0000-0001-6595-9456
Auvikki de Boon http://orcid.org/0000-0003-0067-8877
David Christian Rose http://orcid.org/0000-0002-5249-9021

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