



# Exploring farmer attitudes towards the vaccination of badgers against bovine tuberculosis

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# Executive summary

## Aims and Objectives

In 2021, Defra announced that badger culling would be replaced by vaccination as a means of managing the spread of bovine tuberculosis (bTB) between badgers and cattle. Under these policy proposals, farmers, landowners and wildlife groups would be responsible for vaccination. This report investigates farmer attitudes towards the prospect of vaccinating badgers. It forms part of a larger social research project to examine farmers' current and future willingness to vaccinate, or facilitate the vaccination of, cattle and badgers on their farms.

## Methodology

Participatory workshops were carried out with farmers across England, within a range of bTB risk areas in which participants discussed four badger vaccination scenarios:

- Government-led approach to badger vaccination
- Science-led approach to badger vaccination
- Vaccinating in badger cull areas
- Combined cattle and badger vaccination

The scenarios did not represent any particular policy proposal and were designed specifically to test and identify behavioural triggers from the 'EAST' framework. As such, scenarios sought to identify and test what could make badger vaccination easy and attractive, the social norms that might influence uptake, and the timeliness of vaccination.

## Results

### *Scenario preference*

All four scenarios were unpopular amongst farmers, though the science-led approach with a scientific trial was the least unappealing.

### *Behavioural influences*

In general, workshop **participants rejected badger vaccination as a control method** for bTB. Drawing on the EAST framework, the key objections were:

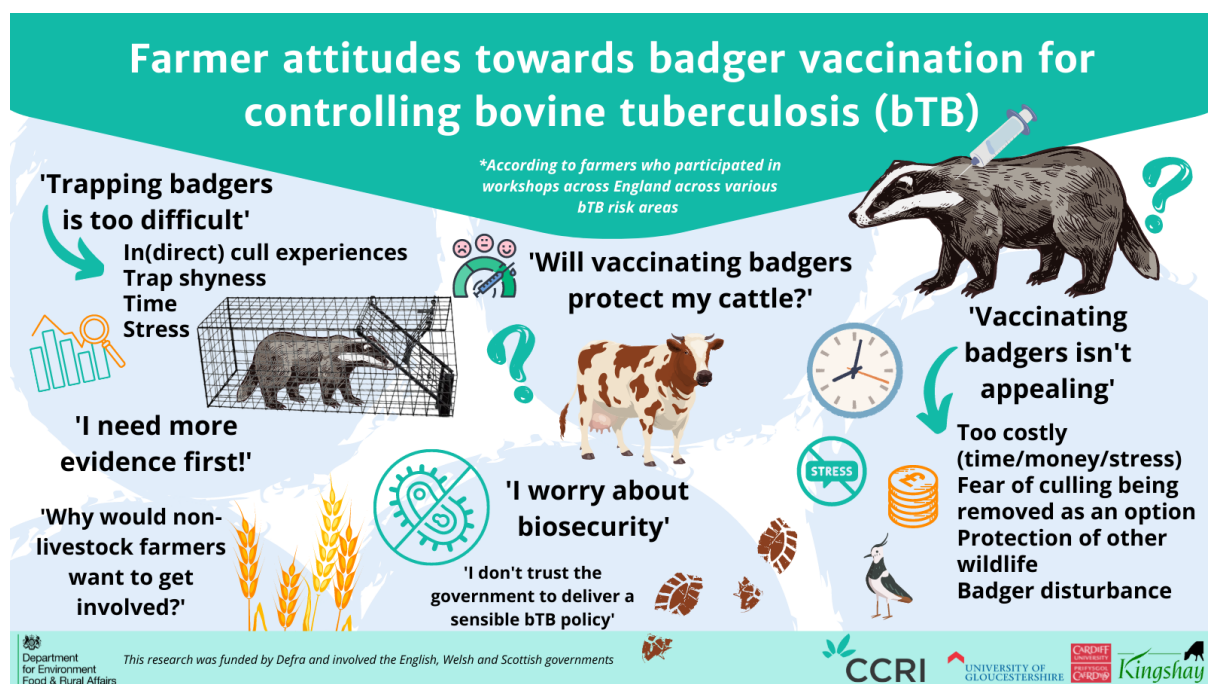
- Badger vaccination was not perceived to be **easy**. There was a consistent view that **trapping badgers is unrealistic**, based on existing experiences and learnings from badger culls (both direct and indirect). Because of these difficulties, often experienced first-hand during badger culling, there was **widespread unwillingness** from farmers to be involved in trapping badgers.
- Badger vaccination was not perceived to be **attractive**. The costs of badger vaccination were perceived to be too expensive, but even when costs were reduced farmers still rejected the technology. Vaccination did not fit with participants' cultural view of the natural world in which vaccination did not contribute to the perceived need to control badger populations

which are seen as unsustainably high. Many farmers believed that culls have resulted in the re-establishment of many other species of **wildlife** (hedgehogs, ground-nesting birds). The risk of **disturbing badgers** upon being vaccinated as a result of the stress caused by trapping was also a concern. Perturbation could result in further spread of bTB from setts where some badgers have not been trapped.

- Badger vaccination was not part of farmers' **social** environment. Participants raised concerns surrounding **biosecurity** on-farm whilst administrators access land to vaccinate badgers. A recognition that **non-livestock farmers will not be motivated** to participate in badger vaccination attempts was noted, resulting in areas where badgers will not be vaccinated. Social learning and a breakdown in social trust linked to culling were also observed, with farmer trust in government bodies and the media degraded as a result.
- Badger vaccination would not be conducted in a **timely** manner. This included general scepticism surrounding whether vaccinating badgers will result in **sufficient protection** against bTB for cattle.

Underlying these findings, participants articulated high levels of distrust in the approach due to wider **systemic distrust in bTB governance**, with farmers generally rejecting the idea of a government-led rollout of badger vaccination.

The following infographic provides a visual summary of the findings above:



## Recommendations

Based on the results from these workshops, encouraging farmers to take part in badger vaccination will depend on establishing trust between the farming community and Defra. Vaccination may have scope where there is no cost to farmers, where a trial is carried out in areas where the rationale for selecting that area is clearly explained to farmers (in the workshops farmers indicated they would prefer a low-risk location, for example), where it is undertaken by trusted organisations who provide farmers with regular updates, and where biosecurity concerns are alleviated.

# 1. Introduction

Badgers are a key reservoir for the bacterium which causes bovine tuberculosis (hereafter bTB) in cattle. As a result, there have been various control measures implemented over the years, including the recent badger culls in certain areas of England. Another potential control approach is the use of the BCG vaccine in badgers. Vaccinating badgers using the BCG<sup>1</sup> vaccine may result in some protection against bTB amongst both badgers and cattle, though there is currently a lack of scientific evidence surrounding how much protection cattle gain (Chambers et al, 2014).

This report investigates farmers' current and future attitudes towards vaccinating, or facilitating the vaccination of, badgers against bTB in England. It is part of a larger Defra-funded social research project which aims to understand farmers' current and future attitudes to cattle and badger TB vaccination in Great Britain. The results of the cattle workshops and interview data with key stakeholders in the livestock industry and cattle trade will be presented in a second report. These data include analysis from farmers and stakeholders in Scotland and Wales; in this report, the focus is badger vaccination in England. As recognised by Chambers et al. (2014), undertaking social science research such as this is an important aspect of policy development surrounding livestock health, as farmer uptake and acceptance are often key to the success of resulting schemes and programmes (see Enticott, 2008; Enticott et al, 2012; Warren et al, 2013). Previous studies have investigated farmer attitudes towards badger vaccination (Maye et al, 2013; Enticott et al, 2014). Farmers in those studies often struggled to articulate their views on vaccination because of the level of uncertainty and unknown details regarding the vaccines. To provide a meaningful understanding of farmers' attitudes to vaccination for this project, and badger vaccination specifically for this report, the research mobilised a social science approach that:

- Explored farmers' views on vaccines that do not currently exist;
- Captured farmers' views on vaccines that have limited/no evidence that they reduce bTB incidence; and
- Recognised the political dimensions of bTB and badger culling.

To action this approach, the research team conducted four participatory, scenario-based badger vaccination workshops across England, covering high, edge and low-risk bTB areas (see methods section). The scenarios were developed using a recognised behavioural framework to identify the main factors that influence or motivate farmer behaviour: making choices easy, attractive, social and timely (EAST). The rest of the report is structured as follows: first, we explain how the participatory workshops were designed, including scenario design, area selection and procedures for data collection and analysis. Second, we present the results, including analysis of farmer reactions to the scenarios and themes within EAST to explain why farmers react as they do to the scenarios presented. In the final section of the report, we discuss the implications of these findings in terms of bTB policy and the potential future roll-out of a badger vaccination initiative in England.

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<sup>1</sup> Bacillus Calmette-Guerin vaccine, which is the main vaccine used for controlling tuberculosis.



## 2. Methodology

### 2.1 Conceptual framework

In order to explore farmers' attitudes towards badger vaccination, research was organised using the EAST (Easy, Attractive, Social, Timely) behavioural insights framework (Behavioural Insights, 2014).<sup>2</sup> Drawing on existing research relating to badger vaccination (Maye et al, 2014), we used the EAST framework to develop a set of general hypotheses to test with farmers:

- Easy – farmers would be more willing to participate in badger vaccination where it was done for them and they had limited practical input;
- Attractive – farmers would be more willing to vaccinate badgers where costs were zero or minimal, and there was evidence that badger vaccination could reduce bTB in cattle;
- Social – farmers were more likely to be willing to vaccinate badgers where communities of farmers worked together and/or those involved were part of the farming community (e.g. vets); and
- Timely – farmers were more likely to be willing to vaccinate badgers when vaccination could be organised to fit in with the farming calendar.

To qualitatively test these hypotheses, a set of hypothetical policy scenarios were developed with which to explore badger vaccination with farmers. The scenarios did not represent any policy intentions that Defra had.<sup>3</sup> Rather, scenarios contained different sets of behavioural 'triggers' relating to the EAST framework, thereby framing badger vaccination as, for example, easy and attractive, or attractive and social. The scenarios were realistic in that they drew on previous badger vaccination research and were framed in familiar policy arrangements, but we reiterated to participants throughout the workshops and interviews that the scenarios were hypothetical and the project was funded research and not part of a policy consultation exercise. In a small number of cases participants in two of the workshops did, despite repeated explanations, appear to treat the research encounters as a policy consultation, which may explain the negativity expressed towards the scenarios. This reiterates the highly contentious, emotive nature of bTB as a research topic and the desperation of some participants for solutions now rather than envisaging possible future policy options. In the small number of cases this arose the research team took extra time and care to explain why we were using scenarios and the value of viewing them in this way to inform future policy design.

Four scenarios were developed, under which a badger vaccination for bTB could be rolled out:

1. Government-led badger vaccination
2. Scientific trial for badger vaccination
3. Post-cull vaccination
4. Cattle and badger vaccination

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<sup>2</sup> For more details see: <https://www.bi.team/publications/east-four-simple-ways-to-apply-behavioural-insights/> (accessed: 01.06.2022).

<sup>3</sup> This hypothetical aspect of the research design was clearly explained to research participants at the start and throughout the process.



The main contribution of each of these scenarios to the EAST framework is shown in Table 1 below.

	<b>Easy</b>	<b>Attractive</b>	<b>Social</b>	<b>Timely</b>
<b>Government-led</b>	State-led (+/-)	No Cost (+)		
<b>Science-led</b>	Limited farmer involvement (+)	Evidence (+)		
<b>Post-Cull</b>		Cost (-)	Group approach (+)	Continuation from culling groups (+)
<b>Combined approach</b>		Cattle vaccination (+)		

**Table 1:** Main EAST components for badger vaccination scenarios

Specific details of each scenario are as follows:

- **Government-led:** This scenario uses a relatively similar approach to current bTB control measures, characterised by state-led intervention. We purposefully included some elements which we expected to be ‘attractive’ or ‘easy’ and others that we expected farmers to see as barriers due to being ‘difficult’ or ‘unattractive’. Under this scenario, we explored whether farmers would be willing to trap badgers for vaccination themselves, as they have done so for badger culls.
- **Science-led:** We developed a scientific trial-based scenario due to awareness that whilst there has been research on how vaccinating badgers can reduce bTB in badger populations (Chambers et al, 2010; Smith et al, 2022), there has been no research into how this protection results in reduced bTB rates in cattle (Chambers et al, 2014). In previous studies social science studies (Maye et al, 2013; Enticott et al, 2014), farmers criticised badger vaccination trials for a lack of a science-led approach (i.e. a failure to assess reduction of TB in cattle).
- **Post-cull vaccination:** Scenario 3 was designed to explore whether farmers would be willing to undertake badger vaccination in response to no longer being able to cull due to the expiration of a cull licence, in particular, to test a social component as farmer-led cull groups are involved in the administration in this particular scenario. Farmers would also make a financial contribution to the cost of the BCG vaccine.
- **Combined approach:** This scenario tested whether farmers may be more receptive to vaccinating badgers where they are also able to vaccinate their cattle simultaneously. It included other triggers related to administration (veterinary technicians) and costs to farmers to test reactions when combined with a strategy (cattle vaccination) that farmers support.

## 2.2 Participatory workshops

### 2.2.1 Case study locations

We conducted four focus groups with farmers in Louth, Frome, Bakewell, and Whitchurch (Table 2). The locations were chosen to represent a range of bTB risk areas and were also based on the researchers’ existing knowledge of the history of policies and bTB prevalence in each area. Farmer participants were recruited using existing contacts known to a farm veterinary group, Kingshay Vets, alongside promotion of the workshops through social media and existing contacts known to the researchers. Farmer and farm data for workshop participants are summarised in Appendix 1. The sample reflects a good distribution across the workshops and in terms of farm types, sizes and TB prevalence; all farms in the sample had some level of experience on their farm with bTB; farms in three of the four areas (bar Louth) had involvement directly or indirectly in the badger cull.

**Table 2:** Overview of the workshops carried out to explore farmers' views towards badger vaccination

Workshop location	bTB status <sup>4</sup>	Workshop date	Participants numbers
Louth (Lincolnshire)	Low-risk area	08/04/2022	6
Frome (Somerset)	High-risk area	23/03/2022	8
Bakewell (Derbyshire)	Edge area	14/03/2022	9
Whitchurch (Shropshire)	High-risk area	04/04/2022	10

### 2.2.2 Workshop format


Each workshop followed the same format. Firstly, participants and researchers introduced themselves; secondly, participants' key hopes and concerns about badger vaccination were discussed; thirdly, each of the scenarios were discussed in turn. Facilitators read out each scenario and provided a visual aid. For scenario 2, for example, participants were told and shown the following:

Scenario 2 – text (this was read aloud to farmers):

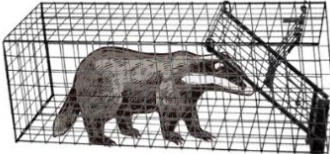
*“Under this scenario, badgers are being vaccinated in 6 key areas in England, each of which are 100km<sup>2</sup> within high risk and edge areas. Yours is one of them. You have been asked to allow access to your land so that researchers, in conjunction with vet techs, can administer badger vaccinations in order to gather epidemiological monitoring data. This effort will help scientists to understand to what extent the badger vaccine is effective for protecting cattle as well as badgers. You will not be expected to pay towards the vaccines. As part of the trial, you will be expected to attend some workshops and provide data on your bTB status on-farm”.*

Scenario 2 - visual (handouts were provided to farmers):


Government-Led badger vaccination




Government are leading the effort in England




You are expected to trap the badgers ready for vaccinating



Once trapped, a government agency representative will vaccinate the badgers




There is no financial cost incurred to you



This will need to happen annually for 4 years

You will need to allow these representatives to access your land as required



<sup>4</sup> According to TB hub (2022) <https://tbhub.co.uk/>.

Once participants had a chance to consider the scenario, they were asked to share their initial reactions with a group and a series of probing questions were asked by the research team to identify specific issues, triggers, ranges of acceptance and so on. We then introduced the next scenario.

Finally, participants took part in a group exercise to identify and rank the most important factors that would make them more likely to support vaccination of badgers. The interview schedule for the workshops, which includes the full text for each of the four scenarios used, is available in Appendix 2.

## 2.3 Analysis

The four workshops resulted in over 9 hours of audio recordings. Once these recordings were transcribed verbatim, in-depth thematic analysis and manual sentiment analysis was conducted using NVivo 12 Plus. This allowed us to identify key narratives surrounding badger vaccination whilst building an understanding of how farmers broadly responded to this approach through conducting manual sentiment analysis, whereby individual discussions were assigned as 'positive' or 'negative'. This coding resulted in a total of 2619 references, reflecting the high level of detail gathered during the workshop and the merit of thematic analysis to identify key findings across the dataset.

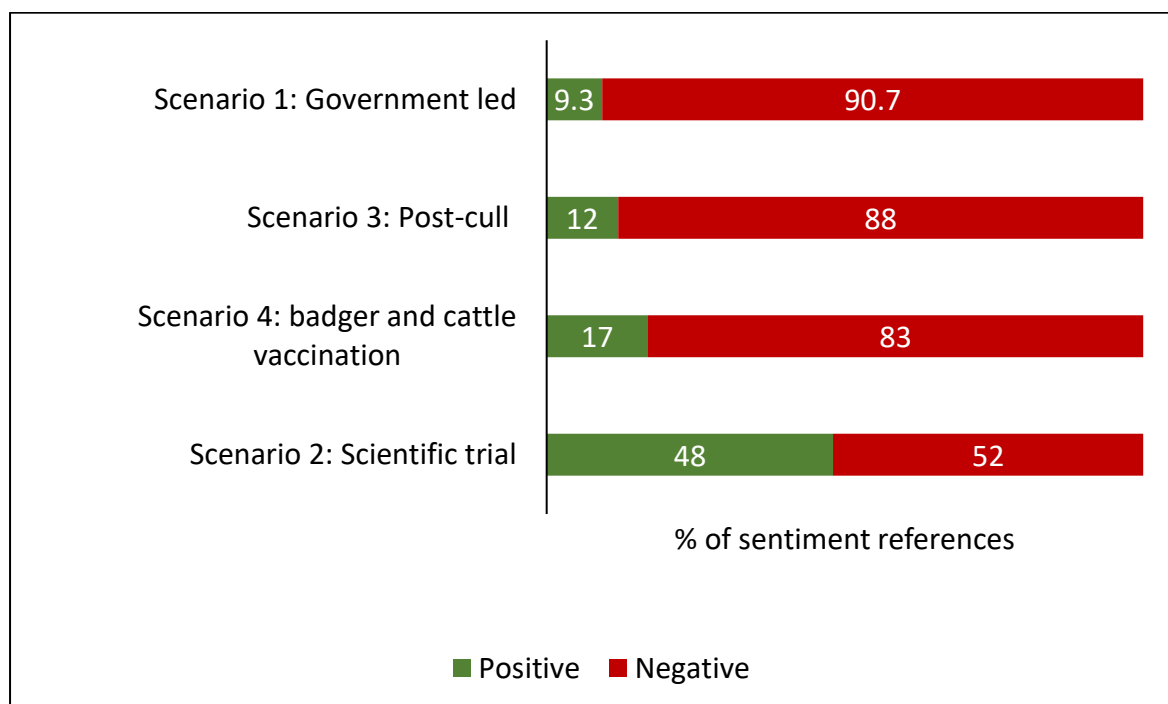
### 3. Results

Across all workshops, there was widespread, repeated rejection of badger vaccination as a control method for bTB. Continued badger culling alongside cattle vaccination are the preferred bTB control approaches, with badger vaccination seen as unrealistic due to several behavioural and contextual barriers. Attitudes towards badger vaccination are complex, with several factors affecting the likelihood of farmer uptake. These factors are investigated below.

#### 3.1. Attitudes towards badger vaccination scenarios

Discussions surrounding all four scenarios were largely negative (Figure 1). The government-led and post-cull approaches resulted in the strongest negative reactions. Overall, we found a consistent level of antipathy towards vaccination, even when it was being made easy in the scenarios (e.g. vaccination is free of charge). The science-led scenario was the least unattractive option.

Figure 1: Positive and negative sentiments surrounding each badger vaccination scenario.



Note: Sentiments in Figure 1 were calculated as percentages based on how many times segments of discussions relating to each scenario were manually identified as being ‘positive’ or ‘negative’. This is used as a proxy to represent broadly how farmer participants responded to badger vaccination.

Table 3 provides an overview of the most frequently mentioned themes which arose during discussions for scenario 1. There were very few discussions where farmer participants shared ways in which the government-led scenario could work. Whilst participants were unhappy about the idea of badger vaccination becoming government-led or mandatory, some accepted that making it mandatory would increase its chances of success. For example:

*‘It would have to be compulsory because we can’t risk having people opting out, it’s gotta be everyone’ - Whitchurch.*

The few positive sentiments for scenario 1 suggested that the only way in which it could work is where culling remains an option, or where the approach begins in LRAs until there is more trust in the protection rates offered by the vaccine.

**Table 3:** Most frequently mentioned themes in response to a government-led approach to badger vaccination

<b>Negative sentiments surrounding government-led badger vaccination</b>	<b>Workshops</b>
A need to control badger populations	All
Trapping badgers	All
APHA administration as unrealistic	All
No incentive to encourage farmer participation	Louth, Whitchurch

Scenario 2 resulted in the most balanced dialogue; 52% of discussions were categorised as negative, with the remaining 48% categorised as positive. Table 4 summarises the most frequent sentiments (negative and positive) for this scenario. Interestingly, for the positive sentiments, themes were mostly caveats to the scenario rather than accepting the approach without changes. Participants suggested that it needed to be rigorous, run by a certain body, undertaken in an LRA or edge area and that farmers should be provided with regular updates. Some participants only appeared willing to accept this scenario if the trial was not undertaken in their area, thus relinquishing their direct involvement, and their hope was often that the trial would prove that vaccination does not work, providing further evidence that culling is the more effective control measure for bTB.

**Table 4:** Most frequently mentioned sentiments towards the science-led scenario

<b>Negative sentiments surrounding a science-led approach</b>	<b>Workshop(s)</b>
Unwilling if culling no longer an option	Bakewell, Whitchurch
Previous experiences with ineffective research projects	Louth
Distrust of certain potential administrators	Louth, Bakewell
<b><i>Positive sentiments surrounding a science-led scenario</i></b>	
If the trial is 'rigorous'	Bakewell
Willing if run by a trusted body	Bakewell, Louth
If undertaken in the right area (LRA or edge)	Bakewell, Louth, Whitchurch
Recognised need for evidence	Frome, Louth
If provided with regular updates	Louth

Most workshop participants responded negatively to the idea of vaccinating badgers post-cull (scenario 3), with very few positive sentiments surrounding post-cull vaccination. The only potential approach included undertaking badger vaccination in conjunction with epi-led culling, assuming little to no cost to farmers. For scenario 4 (badger and cattle vaccination combined), sentiments were mostly negative, with continued frustration towards vaccinating badgers in general. The workshops by this point were becoming saturated in the sense that similar themes re-emerged. Conversations surrounding this final scenario tended therefore be shorter than responses to the other scenarios as

participants had become fatigued after repeatedly stating how unrealistic they believe badger vaccination is in general.

There were some differences in attitudes shared by farmer participants inside and outside existing cull areas. Those who farm in existing badger cull areas were more strongly against vaccination, largely due to their lived experiences of how difficult it can be to implement a bTB control strategy in terms of coordination and the time and effort taken to deliver it. Regarding other characteristics, including herd size and hectarage, there were no discernible differences in response to the idea of vaccinating badgers.

In summary, general reactions were mostly negative. The following sections provide in-depth findings for each component of the EAST framework for each of the scenarios to help explain why farmers' attitudes are so negative towards badger vaccination in general.

### 3.2. Making vaccination easy

Scenario 1 (government-led) and scenario 2 (science-led) were framed in such a way as to make badger vaccination appear easy for farmers. Instead, however, farmers generally perceived vaccination to be difficult (for all four scenarios). It was difficult to find instances where badger vaccination would be perceived by farmers as 'easy'. Reactions and reasoning that farmers gave are summarised below from the workshop transcripts to explain why this is so.

Scenario 1 was hypothesised as easy because it was a government-led intervention, with administration managed by a government representative. The input on the farmer side was an expectancy for them to trap badgers. They would also be involved in the programme over a period of four years, so requiring a time commitment. When designing the scenario, the intention was that it would be perceived as easy as state-led and managed, albeit with some commitment required to assist with trapping. In the workshops the negative triggers in the scenario, particularly the expectancy that farmers would assist with the trapping, dominated discussions. Participants were negative towards farmers trapping badgers and argued that trapping badgers generally was a difficult and time consuming task. The following quotes capture this sentiment well:

*'You just said there's no cost. So my time is free?! It's not a quick job!'* – Bakewell.

*'We aren't going to do it, we're not going to spend the time, people haven't got the time to do it ourselves. To trap the badger, for all the reasons that you mentioned, it takes bloody ages, it takes them months...'* - Frome.

The state-led component was also undermined by a lack of trust in potential administrators. Farmer participants were against the idea of APHA administering a badger vaccination, largely due to a belief that they would not be sufficiently resourced to carry out the task. Previous experiences with APHA influenced this view, with several farmers explaining that roadside testing of badgers has been ineffective due to APHA resources being diverted elsewhere to tackle avian influenza. Wildlife groups, when presented as a possible alternative administrator to APHA in the scenario were also distrusted amongst participants due to a perception that they are unable to see both sides, and a view that they are hypocritical for not supporting a cull which farmers believe is protecting other wildlife. These views surrounding a perceived lack of funding were also found in Benton et al's (2020) research into barriers to the adoption of badger vaccination against bTB.

Scenario 2 was designed to be 'easy' because farmers would not be involved directly in badger trapping or administration; the only requirement was to allow access to their land and to attend information workshops about the trial. Despite these positive triggers, participants kept circling back to discussions surrounding badger populations and how difficult it is to trap badgers for vaccination, with discussions sometimes diverting away from the specifics of the scenario to share experiences of badger culling (direct and indirect). For scenarios 3 and 4, the difficulty of trapping badgers was also a barrier undermining them as potential ways to control bTB.

In summary, there were few positive sentiments across the analysis which relate to the 'easy' component of EAST; instead, there was consensus amongst all farmer participants that vaccinating badgers will be difficult combined with an underlying distrust of a government-led (or wildlife-led) scheme (scenario 1). Reactions to the 'easy' component thus reveal some factors that explain why farmers are not willing to uptake badger vaccination.

### 3.3. Making vaccination attractive

At the design phase of the project, scenarios 1, 2 and 4 were framed in such a way as to make badger vaccination appear attractive for farmers. Instead, however, farmers generally perceived vaccination to be unattractive. This component of EAST generated a number of responses - this is expected in the sense that farmers intuitively find it easier to explain what they do or do not like about a scenario.

The attractiveness component then has different elements, starting with the issue of 'evidence'. Scenario 2 hypothesised that vaccination might be incentivised if it was associated with the collection of evidence relating to vaccination. Indeed, prior to introducing the scenarios, the introductory hopes and concerns exercise conducted with farmers identified the lack of evidence as a key concern amongst farmers. For example:

*'Why would you adopt something that's not proven to work?' - Bakewell.*

*'I'd love for one of them [those responsible for designing the policy] to explain to me how they think they're going to be effective' - Frome.*

*'Why did the National Health Service stop using BCG in the human population? Because its efficacy was only 30%, is what they say. So, how's it gonna work in a badger? How's it gonna work in cattle?' - Whitchurch.*

Participants were in favour of a trial, but with a number of caveats. For example, the trial needed to be seen to be 'rigorous' in order for it to be convincing. For instance:

*'A scientific-led thing like this, it's gonna take some strong evidence to be trustworthy [...] Anything to do with vaccination has got to be done with the same rigour as culling' - Bakewell.*

*'If we need more evidence, then we need scenario 2 [scientific trial], somebody then needs to take the results and say yes, we need to vaccinate, or no it doesn't work' - Louth.*

The question of evidence also emerged in other scenarios, particularly the need to formulate a better understanding of the badger population before vaccinating them – this was viewed as essential to determine their health status and the scale of the task. Discussing the first scenario, for example:

*'Well, the key thing for vaccination is, you've got to have some idea on what population you've got before your start to have some idea what population you vaccinate, you need to do a*



*population survey'* – Bakewell.

*'The animal needs to be microchipped when it's vaccinated. Eventually, you'll get an indication of the size of the population. Which we haven't got, aside from lots of guesstimates'* – Bakewell.

Whilst the finding that many farmers stated a need to see more scientific evidence before considering vaccination may be due to a genuine desire to receive more information surrounding research findings, this view may have also been shared by those attempting to use a perceived 'lack of evidence' as a tactic for delaying the process of introducing vaccination roll-out.

The unattractiveness of vaccination was also demonstrated in relation to the costs of vaccination. Costs of vaccination were brought up prior to the scenarios by participants. For example:

*'I'm just thinking about [the] cost of hiring someone to put a badger in a trap. And then you have one in a trap. It's the time and the cost...'* - Louth.

When scenarios provided costings for vaccination, participants suggested they were too expensive. This was particularly the case for scenario 3 (£60 per ha). For example:

*'This is bloody expensive! This would cost us so much. It's an awful lot of money. So when we are vaccinating and counting my time... it is already just about 10 times the amount that we raised for our badger cull. It's gonna be £600 per hectare. That's the real cost. And that's why there are only a few of these trials...'* - Frome.

*'None of my farmers licenced to our cull would do this. I can tell you that hand on heart. 100%! Because it's not cost them that to cull them! Off the top of my head, the cull was £7.50 a badger, £5.50 per hectare, but we've done that tightly. Other cull areas have charged more [...] And in terms of time, this would take just as much time trapping them - culling and vaccinating will take the same time, if not longer'* - Louth.

Cost was also viewed as a barrier for scenario 4. This farmer from Louth explained why:

*'That cost is way, way too much. When I think about that fee, that's... over 4 years, it would cost... if that was on every hectare, we couldn't afford to do that. It would cost £13-14,000 a year for roughly 100 suckler herd!'* - Louth.

In fact, even when vaccination was offered for free, farmers remained sceptical about its value. Commenting on scenario 1 one farmer commented, for example:

*'There's gonna be no incentive for a farmer to want to do this'* - Whitchurch.

In other scenarios, other dimensions of attractiveness were also explored:

In scenario 1, the need to provide government representatives involved in administering the vaccine access to their land was potentially unattractive and this was confirmed in workshops. This was partly due to biosecurity concerns – vaccinators moving between land parcels/holdings.

In scenario 2, the potential for the area to be selected for a badger vaccination trial could be attractive or unattractive to farmers. In the workshops participants did not want their area to be included in a trial for badger vaccination – one of the main reasons was because this could prevent the possibility

of a badger cull taking place in the area. Biosecurity on farm, as administrators access land (scenarios 1 and 2), was a related barrier:

*'Going from farm to farm, there's a risk of spreading disease anyway, even if you scrub off...and if I went to your farm, and said oh, I have been vaccinating badgers, I can imagine you wouldn't be too happy with me being on your farm' - Frome.*

In scenario 3, badger culling was no longer an option, so the scenario tested attractiveness if no cull option was available. Farmers rejected this option – partly on the grounds of costs and also on the grounds of insufficient evidence that badger vaccination works:

*'You should make more of an effort to gain the evidence first, cull, get the numbers down, get the population smaller, and then try out vaccinating' – Louth.*

In scenario 4, the provision of a cattle vaccine in combination with badger vaccination was assumed to be more attractive to farmers, but responses were mostly negative.

For the attractiveness component then costs of vaccinating badgers are too expensive. Participants responded negatively to the prospect of farmers paying towards badger vaccination. Farmers also included their own time as a cost, rather than simply the direct cost of the vaccination itself. There were wider concerns raised surrounding the cost of vaccinating badgers, with costs incurred by taxpayers also seen as unattractive and unfair. However, cost is not the overriding influencing factor, with farmers rejecting badger vaccination even when it is free of charge – we see this in the discussions related to evidence, for example. Social norms and beliefs play a role too, as we explain below.

### 3.4. Making vaccination social

Scenarios 1 and 3 in particular were framed in such a way as to make vaccination appear 'social' for farmers. Instead, however, farmers generally perceived vaccination not to fit in with their socio-cultural environment.

In scenario 1 farmers were expected to trap badgers to benefit their farm and the community. In scenario 3, the main scenario to test the social component of EAST, this was further extended through a proposed group approach to deliver badger vaccination (farmers working together). These social components were rejected in the workshops, largely because of the difficulty of trapping badgers.

Badger culling provided a social learning experience for farmers, resulting in awareness of how difficult it is to administer, particularly how time-consuming it is to trap badgers. In addition, farmer participants believe that vaccinating badgers will be even more challenging. Over half of the references relating to experiences of culling (n = 84) related to the difficulty of trapping badgers:

*'The trapping part of it is what it seems to be the least effective. The notion that you're going to trap badgers, manage vaccinators, and be effective at vaccination in a reasonable period of time, is, quite frankly, impossible (...)' – Frome.*

*'It is a huge effort. One of our arguments, everybody was tired because we exhausted everyone in the cull group, was tired, because he was [...] the amount of time, effort and money involved in doing it...' – Frome.*

Whilst many farmers were willing to dedicate substantial time and effort to trap badgers for culling, an approach they believe in, they were generally unwilling to spend this time trapping badgers for

vaccination. This is partly because there is not enough evidence that vaccination will be effective for reducing bTB in cattle populations. In addition, in areas which have been part of a cull, farmers believe that badgers will have become 'trap shy', making trapping badgers for vaccination even more resource intensive. Throughout the workshops, this led to discussions surrounding *who* may be able and willing to trap badgers for vaccination. Whilst farmers generally recognised themselves as the most effective trappers, they were unwilling to trap, largely due to them having experienced a cull, either directly or indirectly. Given this experience, most participants have learnt how difficult it is to trap badgers, and the importance of understanding both local landscapes and how badgers behave. In addition, many farmers did not believe in badger vaccination as an approach for controlling bTB, further increasing their reluctance to become involved in trapping for badger vaccination.

Farmers also reflected on past experiences of attempts to vaccinate badgers, which tended to be negative, either due to ineffective trapping by wildlife groups, the nuisance caused by allowing access to their land, and due to biosecurity concerns:

*'Farms were actually pulled out of a badger vaccination trial in Derbyshire (...) because of the biosecurity, vaccinators were driving one farm to the next in 4x4s, going into field with cows... (...) and the farmers said there's a greater risk carried with vaccination because the biosecurity was not...they didn't clean off the whole vehicle, therefore adding an even greater risk to carrying on with a vaccination that's unproven' – Bakewell.*

*'A badger group advertised, are there any farmers willing, I thought, just for a laugh and they accepted, they said, we'll come vaccinate your badgers. So I thought well, I'll give it a chance. But the first year they came, and I was getting the cows in for milking and they drove through the middle of the cows the wrong way, in land rovers, and I wasn't happy! They couldn't bloody wait! I thought, you bastards! (laughs)' – Whitchurch.*

There was also a view shared amongst some farmers in Louth and Whitchurch that trapping badgers to vaccinate them may result in welfare issues due to the stress suffered by the animal.

Trust also plays a significant role in the social component of EAST. Reactions to scenario 2, for example, indicate that past experiences with government agencies and NGOs have a profound impact on whether farmers will engage in a scientific trial surrounding badger vaccination, regardless of whether these experiences related to a previous scientific trial. Similarly, for scenario 1, participants questioned whether the state/APHA could be trusted:

*'The problem is, do you trust a government thing to do the job and deal with all, and to actually come and do it thoroughly? Because they don't really have any interest in sorting TB in cattle...they're all very, very poor in their quality of service' - Bakewell.*

The other key finding is a lack of motivation for non-livestock farmers. Arable farmers are not directly affected by bTB, making it difficult to motivate them to participate in badger vaccination efforts. Participants in all four workshops placed importance on vaccination being carried out by all farmers to achieve significant reductions in bTB prevalence. This is largely due to the recognition that badgers are mobile. Vaccination efforts should happen across all farms. In the Louth workshop in particular, an area characterised by intensive arable farming, participants were particularly concerned about making participation attractive to non-livestock farmers:

*'How much land [in Louth] do you think is controlled by livestock so will have a vested interest in badgers? How much is controlled by arable farmers? 60:40? 70:30 in favour of arable? So, we're only ever gonna get 30% of the badgers in the first place and that's if livestock farmers*

*get every single badger. It's a real mix too, arable amongst livestock [...] You have GOT to buy the arable guys into this somehow, I think that's got to be a key message' - Louth.*

*'People with surrounding arable certainly wouldn't want to necessarily be involved in workshops because what's the point of it for them, they're not gonna give up their time' – Louth.*

The need to involve arable farmers in bTB control is not new; this also applied to culling to some extent, as trapping often needs to be carried out across various agricultural land uses. However, there are some potential benefits of culling for arable farmers, including reduced risk of crop damage as a result of badger activity. With vaccination, there are no immediate benefits for arable farmers. In fact, if it is seen to boost badger populations due to reduced mortality from bTB, arable farmers may be unwilling to get involved.

In the social component then, we see concern about how to motivate non-livestock farmers (the need to extend social responsibility beyond the livestock farming community), combined with other social aspects (trust and learning) which extend beyond specific behavioural triggers.

### 3.5. Making vaccination timely

Scenarios 2 and 3 were framed in such a way as to make vaccination appear timely for farmers. Instead, however, farmers generally perceived vaccination to be untimely. For scenario 2, for example, the material was designed to be timely in responding to previous calls by farmers to provide a scientific trial, with targeted areas of England selected for inclusion. Whilst farmers could see merit in the overall approach compared to others, there was general scepticism surrounding efficacy and whether it would provide sufficient badger protection. For example, the suggestion that if it went ahead it would prove finally that badger vaccination did not work:

*'It'll prove that what it's done is make TB worse and a lot more years would be lost and a lot of energy' - Bakewell.*

These concerns are mirrored by those found by Benton et al (2020), who identified a lack of confidence amongst farmers and landowners in the protection rates that vaccinating badgers is likely to achieve.

In the LRA area, farmers were concerned about the risk of disturbing badgers:

*'My concern with that is that the vaccinations will make them spread, just by upsetting them and that could make things worse in terms of TB' – Louth.*

However, this concern may be unwarranted. Woodroffe et al's (2017) study, for example, found no such effect, with vaccinating and/or trapping badgers resulting in no significant effect on badgers' monthly home range size, distances travelled, or frequency of trespassing in surrounding territories.

In scenario 3, with culling no longer an option, badger vaccination was presented to farmers in the workshops as a timely option to maintain continuation of bTB by farmer-led groups formed to cull badgers. This proposal was quickly rejected in farmer meetings. The overriding view was that making culling no longer available was untimely, with badger vaccination viewed as a step backwards in helping to maintain control of badger populations. For example:

*'Why do they want to vaccinate? They want to vaccinate to remove the cull. Now, what will*

*happen is the population will just go back up, and then TB will come back. Can't we still have the cull alongside?' - Frome.*

*'But we've got a cull and you wouldn't have a cull, they'll take that away. If you're in a scientific trial for the vaccine [there] would actually be no control [of bTB]' – Bakewell.*

*'You finished the cull, so the [badger] numbers are smaller. So it makes sense that these numbers are small to start with when vaccinating but if it doesn't work, the numbers will keep growing. And then the cost will keep going up as they breed' – Bakewell.*

*'The government has said in plans that if there was an outbreak in an area, they would allow us to cull again. If it affected that by doing a trial, I don't think we would be up for doing the trial' - Whitchurch.*

The responses to the timely component of EAST support earlier analysis – in essence farmers do not see badger vaccination as easy or attractive. It is not a question of timeliness per se but instead emphasises how and why farmers do not support badger vaccination as an overarching approach.

### 3.6. Incentivising vaccination

In the farmer meetings, the overriding sentiment is negative, but strategies were employed by the research team to identify possible thresholds, ranges or instances where farmers would support badger vaccination. The science-led approach represents what farmers termed 'the least 'bad' option'. Once farmers had been provided with all four scenarios, they were asked which from their perspective was the most attractive. The science-led approach was the 'least' unattractive scenario. For example:

*'If we're in this, there's no cull there's no other option - the least bad option- if that was the thing that you were saying to start with? Well you know, if there's no trial, you want numbers, you want prove? Well, why not be part of the numbers then? Because I think like everything as it stands, it's never going to happen. There's not going to ever be the political will to take the protection of badgers away' - Bakewell.*

In the workshops, some farmers were not unamenable if the requirement was just to provide access to their land (scenario 1 and scenario 2). For example:

*'If someone is prepared to come and do it, and all we have to do is provide access, and if we're not allowed to cull anymore then I suppose...' - Whitchurch.*

In terms of regional differences, Louth appeared to be the least resistant to the idea of a scientific trial. This is likely due to this workshop being held in an LRA, where bTB prevalence is lower than in the other workshop locations and there has not been a history of culling. This also aligns with the workshops in HRAs, where participants stated that the best place to hold a trial is likely in an LRA or edge area, where trap shyness is less likely, and no badger cull is taking place.

The cost of vaccinating badgers (£60 under this scenario) was rejected immediately by farmers and was the largest negative theme. In response, the facilitators asked participants whether they would be more receptive to post-cull vaccination if the cost were either less (e.g., £20) or free. We found, however, that farmers continued to reject this scenario regardless. For example, at the start of the workshop participants were asked to provide their own indication of acceptable cost thresholds – many compared the cost for badger culling as a baseline and some suggested they would need to be

reimbursed for this time. Most farmers showed little willingness to trap badgers for vaccination themselves (*'Once the culls are finished, the volunteers will disappear. 30% vaccinated - in your dreams! There's a risk of not having anyone actually available to vaccinate badgers...'* -Whitchurch). Some farmers did suggest that they might consider it if they were paid enough to make it attractive:

*'We haven't heard yet how much they're going to pay us to vaccinate them? You know, because you could say we're open to bribery' (laughs) - Whitchurch.*

The cost to persuade farmers to be involved in badger vaccination would likely be extremely ineffective in terms of resource and cost, with most farmers then reverting back to discussions surrounding why culling badgers is the more viable, cost-effective approach for controlling bTB.

*'Well number one, just the logistics, you are expected to trap the badgers in order to vaccinate. So would you pay my complete income for the year so I could go around trapping badgers? Because I can tell you that it won't be like that' – Frome.*

For scenario 4, the only circumstances where farmers may consider vaccinating badgers alongside cattle is where the badger vaccine is free, and where farmers are not involved in terms of trapping and administration, or where farmers are paid to vaccinate badgers:

*'Pay farmers to do it. That way you might get some arable guys on-board' - Louth.*

This is clearly some way from a model where farmers pay or contribute to the cost of a badger vaccination programme – this possibility was firmly rejected by farmers.

## 4. Factors explaining vaccination beliefs

The previous section suggested that none of the behavioural triggers in the scenarios had any meaningful effect on farmers: across each of the scenarios, farmers expressed negative views. This section explores in more detail the reasons behind these views.

### 4.1 Learning from culling

One theme that comes through strongly in the analysis, particularly the social component, but pervasive throughout is learning from the badger cull. In earlier studies, farmers were already sceptical about the practical aspects of badger vaccination. Their experiences from the cull have hardened this viewpoint. For example, of the 307 references categorised as 'concerns' in the corpus, 160 (52%) related to (in)direct experiences of badger culling. We see this in the discussions around the four EAST components, with a constant reference back to the challenge of trapping, etc.

Despite showing very little willingness to trap badgers for vaccination themselves, many farmers were also aware that very few people possess the necessary skills and knowledge to trap them. In some cases, this was evidenced through stories of having observed non-farming groups attempting to trap badgers:

*'They're really not easy to trap. We border a Wildlife Trust nature reserve who are vaccinating badgers, and they've caught on average for the first five years, 5, 6,7 a year. In our first year of culling on our farm alone, and next door, we trapped 27, but that year, they only managed to vaccinate six! And we are next door. How?! They're doing it's full-time! It's their job, they're supposed to be professionals, but that's all they got...6!' – Louth workshop.*

In both Frome and Whitchurch, some participants suggested that there needs to be an alternative way of trapping badgers to make vaccination a realistic prospect:

*'So again, that is a possibility [in Ireland], because they have developed a squeeze trap. So, you get them into the trap, and then they go into the squeeze trap, and then they can test the badger for TB. They can differentiate between a vaccinated and TB badger, so you can see what it's status is before you start, you can see whether the populations is clean or not' – Frome.*

## 4.2 Lack of trust

Trust is a significant factor in the discussions with farmers – we have indicated its influence in the social component when describing farmer reluctance to engage in badger vaccination trials. This signifies a lack of trust in social institutions responsible for delivery and farmers recalled past experiences where state services performed badly. What this does not fully convey though is the general lack of trust in governance surrounding bTB, which was particularly evident in workshops where badger culls were taking place but it was evident in all four workshops. Alongside several farmers suggesting that any badger vaccination roll-out should not be government administered, some exhibited a wider distrust of the government due to past experiences. There were also comments which indicate that farmers do not feel listened to. For instance:

*'Let's see some civil servants reading this! And let's hope they do read it and that they read it and don't put it under the carpet' - Whitchurch.*

Alongside this lack of trust in social institutions that govern TB in cattle, was a general distrust of the BCG vaccine for providing sufficient protection for their cattle. This amounts to a distrust in TB science. For example, alongside repeated conversations surrounding a need for evidence that the vaccine works, some farmers were sceptical that vaccinating badgers will result in any meaningful protection for cattle. In addition, some distrusted the vaccine unless efficacy is very high, with several participants claiming that it should result in 90-95% protection in cattle. This is despite recognition that badger culling has resulted in around 50% reductions in bTB, with less protection garnered in some cull areas:

*'80% is not enough, and you've got to have the evidence that vaccinating badgers has an effect on the incidence in cattle. Without that, it's pointless' - Louth.*

However, some participants in Whitchurch believed that protection rates that align with those achieved from culling would be acceptable. However, they remained sceptical that enough badgers could be trapped to achieve meaningful protection against bTB:

*'I mean, to be fair, you know, and being realistic you'd have to want a badger vaccination to be at least as effective as the best results with a badger cull. Oh, yeah. You know, we're really happy with the badger cull, how that's gone on. Yeah. And if the Downs report can be believed, 66% or so, then I'd say it has to be 66% too' - Whitchurch.*

A belief that other bTB-related instruments, including the skin tests, are inaccurate and distrusted has also affected the extent to which some farmer participants trusted the BCG vaccine:

*'Based upon what we know already with the effectiveness of the skin test and the effectiveness of the blood test, that we are currently doing, and being practiced to, we need a lot of faith because basically we're being asked to do to get through these scenarios and it makes no sense at all' - Frome.*



### 4.3 Badger populations as the problem

Across all four focus groups, farmers claimed that badger populations are either unsustainably high or have only just become sustainable as a result of culling. Participants were concerned that the introduction of a vaccination programme would remove the option to cull whilst simultaneously increasing the survival rates of badgers, thus resulting in a population increase. These findings share synergies with Warren et al (2013), who found that farmers will only consider additional control measures if culling remains an option.

Wrapped up in this rhetoric was the issue that badger survival rates are unsustainably high due to a lack of apex predators, a result of increased food supply (including due to intensive maize cropping), alongside warmer winters. Relatedly, another concern shared by participants throughout the workshops was the view that vaccinating badgers will result in an increase in a population which is already perceived as unsustainably high amongst farmers. For example:

*'Can I ask if the vaccine is effective that will presumably result in higher badger numbers? Fewer badgers would die from TB, so... So if this policy could boost badger numbers. Correct? I suppose what restricts badger numbers is food source. And probably we're probably at the probably highest population that we can sustain at the moment, which is four times what it used to be' - Whitchurch.*

*'I don't think we should vaccinate badgers because of their current population, there are too many badgers to start with. And actually, the healthiest way of dealing with the badger population and making the badger population healthier is to get shot of some to start with! It'll be better for them, too' - Louth.*

*'There's even more of the population of badgers out there spreading the TB around, you do not actually gain and you are losing out as and every year goes by it gets worse. The dirty, dirty badgers are bound to then have more contact with more cattle, and therefore produce more chance of contamination. And then yes, you might have 85% [protection from the cattle vaccine], but the rest, the 15% of cattle that aren't covered by the vaccine, more of them will catch it because they'll have more exposure to the badger, because there are more badgers' – Bakewell.*

Farmers in all four workshops shared experiences of other wildlife recovering post-cull, including hedgehogs, skylarks, and other ground-nesting birds:

*'Why can't we get the truth, the message out to the general public? After the cull we've seen more hedgehogs and ground-nesting birds and there's a sort of disparity in badger population that's becoming overdone, if we can get that message out where the need to be culled is not just for TB but for the benefit of wildlife... so we do a lot of baling and I saw more badgers in one evening than I did hedgehogs all summer. You don't see them now because they're not there. And why aren't they there? Badgers!' – Louth.*

*'In the places where the culls have taken place, you subsequently see numbers coming back and people start to see snipes, ground-nesting birds, skylarks again. It's our biggest thing to remember, research very early on in the cull areas recognized the impact on hedgehog populations (room agrees)' – Frome.*

#### 4.4 Identity politics and anti-farming discourses

Some farmers were against trapping badgers themselves for wider political reasons, largely due to ongoing conflicts with 'antis'. This challenge arose 34 times across the data. In addition to characterising so-called 'antis' as being against badger culling, farmer participants also associated these groups as being 'vegan' and 'anti-farming' on the whole, resulting in polarisation. As a result, some farmers appear reluctant to appease these groups by ending a cull which they believe works for reducing bTB rates. They also, in several cases, repeated the point that culling can increase other wildlife populations, a shared goal between 'antis' and farmers. Related to this theme was the notion that farmers have not been given a fair and just platform to share their experience, with several participants lamenting that 'vegans from the city' are given greater media opportunity than themselves. In addition to some farmers not wanting to appear to appease 'antis', others were sure that anti-cull opposition actors would continue to interfere with trapping even if they were trapping to vaccinate badgers; again, this reflects wider frustration amongst farmers that there are groups who appear to be 'anti-farming' on the whole:

*'Yeah. Got to remember though, you wouldn't have to hide the traps, like the culling, you've got to be quite clever about that. Whereas you could put a trap on a rope. Yeah. They (antis) would still move the traps! They would. We have to be realistic. The people would move it. They protest against farming' – Louth.*

Collectively this means that even where behavioural triggers are overcome, farmers may remain reluctant to uptake badger vaccination. For example, vaccination could be free to farmers with no responsibility held by them to trap badgers, but they may still reject it due to distrust in the government, or due to not wanting to 'appease' those who oppose badger culling.

#### 4.5 Emotional labour, fairness, scepticism and unintended consequences

Whilst behavioural insights can explain much of why farmers respond negatively to the prospect of vaccinating badgers for bTB, there are also other factors contributing to their attitudes. This final theme reflects on a wider feeling from running the workshops that conveys the emotional labour and for some farmers a sense of desperation they feel when trying to deal with bTB. It is not easy to convey on paper the intensity and raw emotion sometimes experienced in the workshops but it was very real for workshop facilitators and the farmers – this was sometimes expressed in laughter, in farmers losing their temper with the facilitators as we asked more and more questions about badger vaccination, or a general feeling of disillusionment, anger and sense of unfair treatment, particularly given the prospect of some workshop locations losing the ability to cull badgers in the future after the hard work and labour some involved committed to make the culls a success. Many of the farmer participants have become emotionally drained by bTB, with some even suggesting that farmers may, in a desperate attempt to control bTB, resort to extreme measures (e.g., illegal culling) if they see no other option.

For example, discussions surrounding how bTB has affected farmer wellbeing and mental health featured at some point across all four workshops. In agreement with Crimes & Enticott (2019), it appears that farmers who have had direct experiences of bTB breakdowns were considerably more likely to raise wellbeing as a concern:

*'Farmers want to take their lives when they are told they've gone down with TB and we're looking at rolling out a support network rolling it out for TB, But that was so important,*

*because a lot of people just didn't realise the mental health of the farmer that wanted to end their lives' – Louth.*

There was widespread scepticism towards the ability of a badger vaccine to control bTB in cattle, whilst most farmer participants across the workshops appear to believe that culls 'work'. This led to several farmers in three of the workshops<sup>5</sup> suggesting that they believe other farmers would consider undertaking 'unofficial' badger culling as a last resort, in particular if legal culling were no longer an option. This indicates that some farmers are so frustrated by bTB that they are willing to participate in illegal activity should the government force them to limit the approaches available to them. The below quotes are all from different workshops:

*'The problem with this is actually getting a true serious scientific trial, in a big area, because if there was no cull going off, you would have a level of unofficial culling going on'.*

*'It makes us criminals! -chatter- Why is the sentience of a badger, much more considered than a black and white cow? It's just nonsense, with a cow you do so much good...'*

*'You ain't gonna stop the culling... you might stop the legal culling but they're two different things'.*

## 5. Discussion

This report provides insights into farmer attitudes towards the vaccination of badgers against bTB. We find that farmers offer no support for the approach and that even if certain triggers were used to encourage uptake, this is unlikely to result in successful vaccination of badgers as several non-behavioural factors, including eroded trust and entrenched views that badgers need to be controlled in order to reduce bTB prevalence in cattle. The only scenario which may have limited scope was the science-led approach. However, this is heavily caveated, and this approach would need to include several triggers (Table 5), some of which may be unrealistic to deliver at scale.

**Table 5:** How an iterated science-led scenario may result in some acceptance of badger vaccination

Science-led approach for badger vaccination: potential triggers for some uptake	
<b>Administrator</b>	Non-government, non-wildlife group, likely a University or other independent research institution
<b>Farmer empowerment</b>	Farmers provided with regular updates on progress
<b>Location</b>	Low-risk area/Edge area with no cull history
<b>Trapping</b>	Experienced trappers (if farmers, paid for their time)
<b>Biosecurity</b>	Those accessing land to follow rigid biosecurity rules
<b>Additional approaches</b>	Epi-led culling

<sup>5</sup> We have not disclosed workshop location per quote to protect the anonymity of research participants.

## 5.1 Policy implications

The findings set out in this report indicate that participants of our workshops are far from ready to accept a badger vaccination programme, with most responding negatively throughout discussions. There are, however, some steps that could be taken to slowly increase the likelihood of farmers accepting badger vaccination as an approach for controlling bTB:

1. Commission **robust scientific trials** to build trust in vaccination as an approach, before rolling it out in other areas, including communication with farmers and industry stakeholders to explain the rationale for why those areas were selected for inclusion in the pilot.
2. Provide **doses of the Badger BCG vaccine free of charge** and **pay them** for any time they spend on being involved in delivery, thus resulting in minimal cost to farmers.
3. Allow farmers to undertake **epi-led culling and cattle vaccination in conjunction** with badger vaccination.
4. **Alleviate biosecurity concerns** by introducing a set of clear guidance for anyone visiting farms to vaccinate badgers.
5. **Seek alternative approaches to trapping badgers** to overcome concerns surrounding trap shyness. One such approach may be to undertake further experiments with pre-baiting to overcome trap shyness (see George et al, 2014).
6. Explore ways to **motivate non-livestock farmers** to buy into a badger vaccination roll-out.
7. Give farmers more of a **voice in the public sphere** to ensure they feel empowered and that their knowledge on bTB control is being given more of a platform.

The second report from the project will examine farmer attitudes and future prospects for cattle vaccination, including the views of those in the cattle industry and cattle trade.

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## Appendix 1: Workshop participants - farming characteristics and TB history

Proforma Badger Workshops (N = 32)									
Total farm area (ha):									
Min:	24	Median:	182	Average:	289	Max:	2400		
Main farming enterprise (%):									
Dairy	34	Dairy and beef	25	Beef only	13	Beef and arable	19	Other and not specified	9
Number of cattle:									
	Heifers	Steers	Cows	Calves	Bulls	Not specified			
Median value	80	10	140	35	1	3			
Income from cattle (%):									
Average:	76%	Median:	90%	Not specified by over 50% of participants					
Purchase cattle:									
Monthly	9%	Yearly	9%	Less than Yearly	38%	Never	38%	Not specified	6%
Sell cattle:									
Monthly	44%	Yearly	16%	Less than Yearly	3%	Never	6%	Not specified	16%
TB status:									
Never had TB	22%	Single TB event	22%	Repeated / multiple events	34%	Currentl-y under TB restricti-on	19%	Under restrictio-n for over 12 months	19%
Use of cattle vaccinations / treatments:									
Leptospiro-sis	Respirato-ry diseases	Clostridi-al diseases	Mastit-is	Lungworm	BVD	Ringwor-m	Pneumo-nia	Salmonell-a	None / Not specified
22%	34%	19%	6%	9%	19%	3%	3%	3%	22%
Participants in a cull area:									
Yes	69%	No	25%	Not specified	6%				



## Badger bTB vaccination workshop schedule

### Welcome and Introductions

As participants enter, ask them to read information sheet, sign informed consent form, write their name on a label, and complete the pro-forma.

### WORKSHOP BEGINS

Who is in the room - facilitators

Who is in the room – participants

- Where you farm / type – very briefly

Background to project

- Aims
- Funders

Time (minute)	Activity
10	Participants enter workshop, grab coffee/snack, add nametags, complete characteristic pro-forma
10	Participants go around the room and introduce themselves using just 2 sentences (name, farm type, headage, TB experience)
5	Introduction to the workshop – setting the context
10	Initial scale exercise
15	Scenario 1: Government-led badger vaccination
15	Scenario 2: Badger vaccination as a scientific trial
15	Scenario 3: Badger vaccination in post-cull areas (ONLY CULL GROUPS)
15	Scenario 3(/4): Badger and cattle vaccination
10	Summary and close

### Introductory Questions

We are here to find out your views about a badger vaccine for TB. As we work through this, please bear in mind that not every badger needs to be vaccinated to make a difference as herd immunity will eventually take hold.

REITERATE THAT WE ARE NOT DEFRA

Thinking about badger vaccination for TB, what is your one main hope and expectation about a badger vaccine?

*Ask participants to write their answers on post-it notes before having a discussion.*

- (could be: less/no need to cull; freedom from TB; eradication; etc etc)

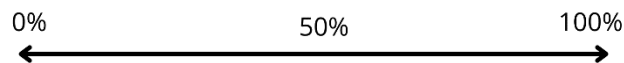
What is your biggest concern surrounding badger bTB vaccination?

- (could be: time; cost; trade; timeliness; trust to deliver; efficacy (badger / cattle); other wildlife...)

### Scale activity 1: Cost



### Scale activity 2: Protection rates



### Notes to guide first two exercises.

**We are now going to do a quick scale exercise.**

Firstly, on the scale we are now showing you (0-100%), please decide the level of TB reduction in cattle arising from badger vaccination that is acceptable to you.

Next, on the same scale (0-100%), please decide the level of TB reduction in BADGERS arising from badger vaccination that is acceptable to you.

OK, we'd now like to know how much you would be willing to pay per hectare based on that level of TB reduction. [Show the scale, £0-£80]

**Note for facilitator: Bear these results in mind when presenting subsequent scenarios**

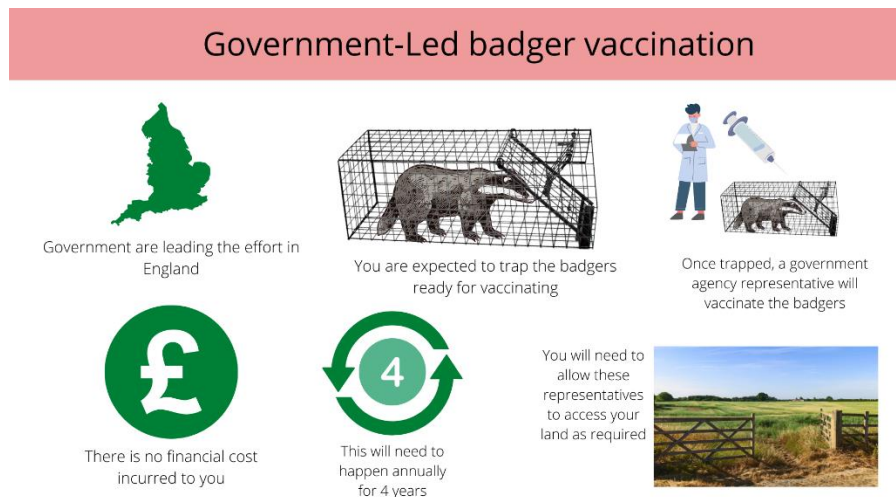
We are now going to look at some scenarios for badger vaccination. Please bear in mind that these are *hypothetical* and do not necessarily reflect Defra's approach.

## Scenario-based questions

Defra and the Welsh government are rolling out a badger vaccination scheme and are seeking ways of encouraging uptake. We are now going to take you through some potential scenarios under which the roll-out may occur.

### Scenario 1: Government-led badger vaccination

Refer farmers to the following visual:



In this first scenario, the government are leading a national badger vaccination effort in England. You will be expected to trap badgers ready for vaccinating. Once you have captured a badger, government agency representatives will come and administer badger vaccines and will ask that you give them permission to access your land as required. Annual vaccinations will take place for 4 years. There will be no cost incurred by you under this scenario.

- What are your initial reactions to this scenario?
- Are you happy with the government being responsible for vaccinating badgers, or is there someone else who may be better suited?
- *Wildlife groups, cull groups, vets, farmers, vet techs*
- Who would they be most comfortable with accessing their land under this scenario?
- Would you need any further incentives to encourage you to allow vaccinators onto your farm to administer badger vaccines?

### Scenario 2: Badger vaccination as a scientific trial

Refer farmers to the following visual:

## Badger vaccination as a scientific trial



6 key areas in England  
(100km<sup>2</sup>, high risk/edge)



You have been asked to give access to your land so that researchers and vet techs can vaccinate badgers



This will allow scientists to gather epidemiological data on how much protection vaccinating badgers gives cattle from bTB



There is no financial cost incurred to you



You will be expected to participate in some workshops and provide data on your bTB status

Under this scenario, badgers are being vaccinated in 6 key areas in England, each of which are 100km<sup>2</sup> within high risk and edge areas. Yours is one of them. You have been asked to allow access to your land so that researchers, in conjunction with vet techs, can administer badger vaccinations in order to gather epidemiological monitoring data. This effort will help scientists to understand to what extent the badger vaccine is effective for protecting cattle as well as badgers. You will not be expected to pay towards the vaccines. As part of the trial, you will be expected to attend some workshops and provide data on your bTB status on-farm.

- What are your initial reactions to this scenario?
- What would incentivise you to take part in this trial?
- Would the protection rate you'd expect differ at all to the percentage you agreed on at the start of this workshop? [FACILITATOR TO INSERT % THEY AGREED ON]
- What types of evidence would you need to convince you that badger vaccination works for protecting cattle from bTB?

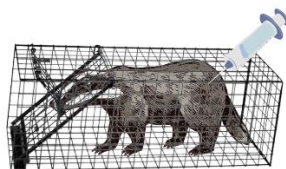
### Scenario 3: Badger vaccination in post-cull areas

Refer farmers to the following visual:

#### Badger vaccination in post-cull areas



Cull licence has ended



Cull group administers



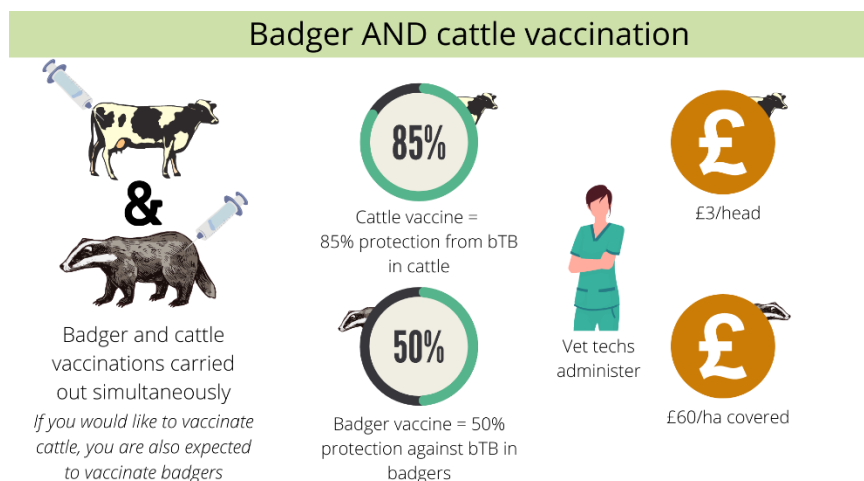
£60/ha covered

We are now going to introduce another scenario. Under this scenario, the government is seeking to encourage vaccination in culling areas that have come to the end of their licence. The vaccine costs £60 per hectare. The cull group is responsible for administering the vaccines.

- What are your initial reactions to this scenario?
- Under this scenario, who do you think is best placed to administer the vaccine?
- Probe: vets, vet techs, wildlife groups, government agency, farmers, cull groups
- As part of a cull group, would you be willing to switch the vaccination at the end of your culling period
- Does the proposed cost align with your expectations – how much should it cost?
- Would the protection rate you'd expect differ at all to the percentage you agreed on at the start of this workshop? [FACILITATOR TO INSERT % THEY AGREED ON]
- What do you think would incentivise people to uptake badger vaccination under this scenario?
- *Probes – testing, compensation, trade*

#### Scenario 4: Badger and cattle vaccination

Refer farmers to the following visual:



Under this scenario, badger and cattle vaccines are being rolled out simultaneously. If you would like to vaccinate cattle, which results in 85% protection against bTB, you are also expected to vaccinate badgers, which provides badgers with 50% protection against bTB and some additional protection for cattle. Vet techs will administer both vaccines, which need to be carried out annually. You will contribute to the costs, £3 per head for cattle and £60 per hectare for badgers. The remaining cost will be covered by the government.

- What are your initial reactions to this scenario?
- What would you be willing to pay under this scenario? Is it any different to the cost you stated at the start of the workshop?
- Who would you like to administer the vaccine under this scenario?
- Would the protection rate you'd expect differ at all to the percentage you agreed on at the start of this workshop? [FACILITATOR TO INSERT % THEY AGREED ON]

**CLOSE WORKSHOP. THANK PARTICIPANTS FOR THEIR TIME. EXPLAIN NEXT STEPS (analysis, etc.).**