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Theories of Change in Rural Policy Evaluation

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Abstract

Rural policy evaluation helps to understand the extent to which policies have met pre-defined objectives, achieve value for money and learn from implementation failures. However, there is increasing debate over the quality of policy evaluation and the extent to which its methods can fully contribute to an understanding of rural policy. Responding to these calls, this paper employs a theory driven approach to policy evaluation to assess the social impacts of attempts to reduce animal disease on farms in England. Popular in other policy arenas, theory driven evaluation relies on developing a theory of change to examine the interactions between policy contexts and mechanisms and policy outcomes and determine what works for whom. Drawing on longitudinal qualitative and quantitative research, the paper identifies two mechanisms of change to evaluate the Badger Vaccine Deployment Project (BVDP) in England to reduce incidence of bovine Tuberculosis (bTB) in cattle. The papers shows how these mechanisms – ‘seeing is believing’ and ‘practice similarity’ – are triggered by different contextual factors leading to the failure to deliver expected policy outcomes. We also consider the advantages and limitations to theory based evaluation, and the contribution it can make to the evaluation of other rural development programmes.

Keywords. Theory driven evaluation; Theory of change; Longitudinal analysis; Rural biosecurity and animal disease policy; Bovine Tuberculosis; Badger vaccination.

1. Introduction

Evaluating the outcomes of rural policy initiatives, particularly those associated with Government funded schemes, is a key element of rural studies. Evaluation is important in order to understand the extent to which policies have met pre-defined objectives and achieve value for money. Evaluation may also focus on the implementation of policies to address implementation failures ([Dax et al., 2014](#)). On the face of it, rural policy evaluation may appear to be a 'good thing', providing a rational approach to the needs of rural development. Yet, there is increasing debate over the quality of policy evaluation and the extent to which its methods can fully contribute to an understanding of rural policy ([High and Nemes, 2007](#); [Shucksmith, 2010](#); [Dwyer et al., 2008](#)). For example, writing about the evaluation of the European Union's LEADER programme, [Dax and Oedl-Wieser \(2016\)](#) call for evaluation approaches to 'go well beyond' traditional approaches reliant on indicators, whilst others have called for a greater range of qualitative methodologies in rural policy evaluation ([Vanclay, 2015](#); [Mayne, 2004](#)).

Such debates are long-standing in the policy evaluation literature ([Blalock, 1999](#); [Martin, 2005](#); [Fitzgibbon, 2002](#)) in which researchers have instead attempted to transcend traditional dualistic quantitative and qualitative approaches by developing bottom-up evaluative methods. These approaches, generally referred to as 'theory driven evaluation' ([Weiss, 1997a](#); [Weiss, 1997b](#); [Weiss et al., 1995](#)) or 'theory of change' ([Pawson and Tilley, 1997](#)), frequently involve bottom-up participatory design and rely on multiple methodologies. More specifically, they help to open up the 'black box' of policy making ([Stame, 2004](#)) and move beyond asking whether a policy works to an understanding of how it works ([Pawson, 2002](#)). [Chen \(1990\)](#) suggests that it is only through 'theory driven' evaluation that it is possible to understand why, for whom and in which contexts policy works.

Whilst theory driven approaches to evaluation are not common within evaluations of European rural development initiatives, they are frequently deployed within the evaluations of, and used to develop, rural policy in developing countries ([Maru et al., 2018](#); [Richardson et al., 2018](#); [Higgins et al., 2018](#); [Nayiga et al., 2014](#); [Thornton et al., 2017](#); [Douthwaite et al., 2017](#); [Apgar et al., 2017](#); [Breuer et al., 2016](#)). Others have shown how theory driven approaches can help evaluations of urban renewal projects ([Mehdipanah et al., 2015](#)) in order to reveal the complexity that formal evaluations struggle to accommodate ([Stame, 2004](#)). Building on these studies, this paper explores the potential for theory of change approaches in the evaluation of the social impacts of rural policy interventions. To do so, the paper draws on a five-year longitudinal evaluation of a biosecurity intervention on cattle farms in England. The longitudinal approach allows us to examine not just what impact this policy has, but by developing a theory change, evaluate how policy works, for whom and in what context. At the same time, the longitudinal methodology contributes to and extends existing rural and farm biosecurity research that to date have largely relied on cross-sectional data.

The paper is structured as follows. Firstly, it considers how theory driven approaches can assist rural policy evaluation and can address current methodological debates facing rural policy evaluation. Secondly, we build a theory of change to use to evaluate the social impacts of a farm biosecurity policy. After providing methodological details, we put the theory of change into action to describe how and for whom the policy works. Finally, we consider broader questions relating to the theory of change, biosecurity policy and rural policy evaluation.

2. Rural Policy Evaluation and the Theory of Change

Whilst the role and evolution of rural development policies is an ever-present topic in European rural sociology, less attention has been paid to the methods and approaches used to evaluate these policies (but see: [Vanclay, 2015](#); [Dax and Oedl-Wieser, 2016](#); [Dax et al., 2014](#); [Dwyer et al., 2008](#)). Despite this lacuna, some key arguments are discernible in the literature, including but not limited to expectations regarding efficacy and effectiveness, which support the need for more advanced theory-driven approaches to rural policy evaluation. There is not space here to review the rural development literature in detail, but some important points emerge that inform the approach to animal health policy evaluation reviewed in the next section of the paper.

The first argument is the relationship between the 'rural development' concept and what this means in terms of evaluation approaches. In essence, there is greater recognition for more complex evaluation approaches as the 'rural development' concept itself has evolved from something dedicated primarily to agriculture and food production to analysis of the multi-functionality of agriculture and rural areas. This includes, for example, the shift from exogenous to endogenous rural development (van der Ploeg et al., 2000), the 'living countryside' concept ([Commission of the European Communities \(CEC\), 2003](#)), multifunctionality ([Marsden and Sonnino, 2008](#)) and 'networked development', all of which conceptualise rural development as a multi-dimensional, integrated and multi-actor process. Recent debate about neo-productivism and rural development, linked to well-documented global food, energy and resource crises, arguably signals a return to sector-based compartmentalised thinking. However, the debate if anything reiterates the need to capture and better understand multi-level interconnections between in this case agri-food systems of provision and other forms of rural economy. Crucially, these approaches to rural development all demand policy evaluation frameworks that better capture interrelations between economic, social and environmental processes, including how best to develop and maintain them, as well as frameworks that develop a better appreciation of the integrated impact of associated policy actions ([Dwyer et al., 2007](#)).

A second key argument in the rural policy evaluation literature is growing recognition that frameworks to evaluate EU Rural Development Programmes (RDPs), including measures and support for LEADER, are if anything going the other way, defined as increasingly technical output indicator-driven exercises ([Dwyer et al., 2008](#); [Dax and Oedl-Wieser, 2016](#)). In the 2007-2013 programme, for example, a larger set of instruments and measures were made available but this diversity then required a more streamlined method to evaluate programme impacts under what is termed the 'Common Monitoring and Evaluation Framework'. This indicator approach is a linear, measure-based intervention evaluation logic, designed to enable comparison at a European level but the shift to quantitative indicators fails to capture regional context, local actors and the importance of social innovation processes as key elements of programme performance ([Dax et al., 2014](#)). This is ironic given the bottom-up intentions of RDP programmes and particularly LEADER. For the latter, processes of mainstreaming have demanded more technocratic processes to evidence impact. The above developments have initiated significant debate from rural development practitioners and evaluators who are concerned that the spirit of LEADER is being lost. Analysts are calling increasingly for greater use of qualitative methods and 'soft' indicators to capture processes that are not easily measureable but significant in terms of social innovation and socio-economic outcomes. This is not a new debate. Cloke et al.'s ([1995](#)) work on rural lifestyles in the 1990s, for example, called for greater priority to be given to qualitative evidence to better understand rural policy impacts.

This is important given a third argument, which is to recognise the role of context, or in the case of RDPs, regional specificity. Studies show, for example, that Member States and regional administrations interpret a common vision for rural development, as defined within the second pillar of CAP, in different ways ([for example: Lowe et al., 2002](#)). Different contextual factors are in play. For instance, it may be due to existing policy trajectories and the influence of the agenda of different actors and stakeholders who are involved in drafting and implementing rural development policy ([Dwyer and Maye, 2010](#)). Regional variability in spending and priorities can also be a reflection of ideological and organisational differences, as well as historical legacies or path-dependency in policymaking ([Dwyer et al., 2007](#)). These contextual differences influence the development and operation of rural development policies and it also affects their performance and outcomes. This explains why there is increasing need to place greater emphasis on policy design and implementation processes. Policy design in this context refers to the content, evolution and structure of public policy ([Schneider and Ingram, 1999](#)), taking account of the wider context within which it operates in order to understand why, how and where policies have developed, and the instruments and operational modalities chosen for implementing them. For rural development programmes under the CAP this translates as examining the design of national programmes and their underlying aims and drivers ([Dwyer and Maye, 2010](#)).

Theory of change (ToC) approaches to evaluation have the potential to fill these evaluation gaps. By no means new, ToC approaches to evaluation have experienced a surge of interest since the mid-1990s. Their origins, however, lie in theory based evaluation (TBE) whose fundamental tenet is 'that the beliefs and assumptions underlying an intervention can be expressed in terms of a phased sequence of causes and effects (i.e. a program[me] theory)' (Weiss, 1997b, 501). By focusing on programme theory, the aim is to open up the 'black box' of policy making ([Stame, 2004](#)) to understand not just whether a policy achieves its intended goals but also the reasons why ([Pawson, 2002](#)). [Chen \(1990\)](#), [Weiss \(1999\)](#) and [Pawson and Tilley \(1997\)](#) all suggest that it is only through 'theory driven' evaluation that it is possible to understand why, for whom and in which contexts policy works.

The use of the word theory is at times confusing and misleading ([Blamey and Mackenzie, 2004](#)). As Weiss (1997) points out, programme theory should not be abstract but targeted at the causal chain within policies. These causal theories may be influenced by more abstract theory, but they are specific to the parts of the policy to be evaluated. In this sense, theories represent 'hypotheses which people consciously or unconsciously, build their program[me] plans and actions' (Weiss, 1997, 503). However, whilst policies may have several underlying theories, they are rarely explicit. Instead, theory based evaluation can adopt different ways of identifying them. For example: [Chen and Rossi \(1989\)](#) suggest that policies have no coherent theory and evaluators should endeavour to establish it; [Weiss \(1999\)](#) suggests that policies are a muddle of theories and that identifying the ones to evaluate should be achieved through consensus; finally, [Pawson and Tilley \(1997\)](#) suggest that theories are enacted by policy participants, and that selecting the ones to analyse comes through a process of 'adjudication'.

It is through the identification of theories that ToC approaches may also address critiques of formal evaluation procedures of rural development programmes. Theories can be retrospective (developed after a policy has been implemented) or predictive (developed as part of policy development and design). Participatory approaches to theory development can therefore embed stakeholders within both the evaluation and the project design from an early stage ([Richardson et al., 2018](#)) such that projects transform social relations between project partners as much as they deliver project outcomes ([Apgar et al., 2017](#)).

Whilst there exist different ToC approaches to evaluation, there nevertheless remain key similarities. Firstly, context is considered key to uncovering the circumstances in which policies work ([Blamey and Mackenzie, 2004](#)). Thus, in Pawson and Tilley's (1997) ToC-based realist evaluation, *contexts* refers to the place and people specific factors in which policies are deployed. For example, in rural policy, different socio-economic and environmental factors may influence the extent to which a policy succeeds. Local cultures, implementation approaches and styles of regulation can also provide the context in which any given policy operates.

Secondly, *contexts* link to *mechanisms*, defined as 'what it is about programmes and interventions that bring about any effects' (Pawson and Tilley, 2004, 6). *Mechanisms* are common to theory driven approaches to evaluation ([Dalkin et al., 2015](#)) and refer to the kinds of responses generated by the implementation of new policy programmes ([Weiss, 1997b](#)). In Pawson and Tilley's realist evaluation, mechanisms represent the 'resources' offered to people that enable them to make the policy work – in intended or unintended ways. Programme mechanisms represent the 'process of how subjects interpret and act upon the [policy]' (Pawson and Tilley, 2004, p.6). For example, evaluating the impact of closed circuit television (CCTV) to reduce crime in car parks, Pawson and Tilley (1997) identify eight potential mechanisms, including: the 'nosy parker' mechanism (in which CCTV leads to enhanced natural surveillance to deter car crime) and the 'memory jogging' mechanism (in which CCTV prompts car owners to take greater care with locks and valuables). Programmes may work in multiple ways – intended or otherwise – so theory driven evaluation must carefully assess the extent to which different mechanisms exist.

Finally, *outcomes* refer to the impacts of policy. For rural social policies, outcomes are frequently obvious, although other hidden, tangential and unintended outcomes should be expected. Evaluating any rural policy is therefore a matter of identifying the different *context-mechanism-outcome* relationships to establish in which contexts mechanisms lead to desirable outcomes.

Like all policy evaluation approaches, theory of change approaches are not without their problems. Most significant of all is that they are only as good as the theories they rely upon. Where the programme theory of a policy is obscure, or there are political sensitivities around the policy, it may be difficult to elicit theories in the usual way by examining documents or talking to key actors. Similarly, developing a ToC may appear to play into the hands of the critique of rational policy making in which goals and programme activities adapt during the life of a policy. In this view, ToC frameworks lock-in evaluators and are too inflexible to accommodate change. [Weiss \(1997b\)](#) disputes this, however, arguing that whilst conceding complexity is added by considering new lines of enquiry and possibilities of change, the ToC approach is readily adapted.

3. Developing a Theory of Change for Farm Biosecurity Policies

Attempts to understand the geographical spread of animal disease management have largely focussed on the epidemiological outcomes of disease control. The key outcome is: has disease incidence declined? Where disease eradication programmes have been successful, *post-hoc* explanations of success focus on technical excellence, standardised practices, and stakeholder involvement ([Livingstone et al., 2015](#); [Tweddle and Livingstone, 1994](#); [Lehane, 1996](#)). Rarely have their social outcomes been evaluated. Research has examined the relationship between, for example, farmers' intentions to implement animal disease controls and their attitudes and perceptions ([Gunn et al., 2008](#); [Heffernan et al., 2008b](#); [Heffernan et al., 2008a](#)).

However, predominantly, studies are cross-sectional ([Enticott et al., 2014](#)) and there are few longitudinal studies that examine how disease control initiatives result in changes in acceptance, and the reasons for them, towards specific control measures.

In the United Kingdom, biosecurity interventions to prevent the spread of animal disease may be funded by national governments, and/or by European funding through rural development funds. For the purposes of this paper, our focus is on the management of bovine Tuberculosis (bTB) which is recognised as the most challenging animal disease problem in the UK ([Godfray et al., 2018](#)). Since 2012, the management of the disease has been partly funded by the European Union. A key challenge has been limiting the spread of bTB from wildlife – badgers – to cattle. Badger culling policies have proved controversial, and their efficacy questioned ([Independent Scientific Group \(ISG\), 2007](#)). As such, the vaccination of badgers came to be seen as an alternative solution when a vaccine became available in 2010. Anticipating this announcement, the Department for Environment, Food and Rural Affairs (Defra) announced a programme of badger vaccination in 2009, known as the Badger Vaccine Deployment Project (BVDP) ([Defra, 2009](#)). The BVDP was not framed as a scientific trial to assess disease incidence but was rather described as an attempt to understand “how best to practically deploy vaccines, including how best to work with all stakeholders to deliver a vaccination programme and an understanding of training needs, *we aim to build confidence in the principle and practicalities of vaccination*”. ([Defra, 2009: emphasis added](#))

Adopting a ToC approach to the evaluation of the BVDP, we sought to identify the contexts, mechanisms and outcomes that were integral to the workings of the project. As such, we interviewed policy makers, conducted documentary analyses, and drew on existing social research and theoretical perspectives of scientific controversies to identify CMO linkages to evaluate.

In terms of *context*, traditional biosecurity analyses focus on farm management styles and disease incidence. For example, in areas of high disease prevalence farmers’ assessment of the disease risk and their subsequent behaviour may differ compared to those in lower areas of risk. Similarly, farm business models that are more vulnerable to the effects of bTB may have different views of vaccination. Whilst these contexts are important, the BVDP introduces another contextual layer, that of institutional support or action in relation to wildlife infection. Alongside this we may also think of other forms of contextual social support, such as that offered by farmers’ vets.

Building on these biosecurity contexts, identifying the BVDP’s *mechanisms* was harder to establish at the outset of the research. In farmers’ meetings prior to the launch of the BVDP, the idea that vaccination was free and ‘something for nothing’ was used to encourage acceptance by Defra officials. Alternatively, press releases and publicity welcomed the involvement of farmers in the BVDP, suggesting they could ‘learn lessons’ ([Defra, 2009](#)). By encouraging them to participate for the full 5 years, farmers would also be able ‘maximise their chances of seeing benefits, as it will take time for badger vaccination to have a knock-on effect on the risk of disease to their cattle’ ([Defra, 2009: 5](#)). This addressed earlier criticisms of the government’s approach to studying badger culling as being too distant, with farmers held at arm’s length resulting in distrust of scientific knowledge (Enticott, 2008). We refer to this mechanism as ‘seeing is believing’ in which exposure to the vaccination practices and its potential is linked to acceptability. A second mechanism emerged during the research process itself, which we refer to as practice similarity. Drawing on ideas of behavioural spillover ([Thøgersen, 1999](#)), practice similarity suggests that where new interventions (i.e. vaccination of badgers) are similar to existing practices (such as vaccination of cattle), this similarity acts as a mechanism – or what [Dietz et al. \(2009\)](#) call a ‘wedge’ – for

acceptance, and potentially, additional biosecurity activities. Practice similarity may also work through an alignment of similar identities: vaccination implicitly proposes a specific form of biosecurity 'good farming' ([Burton, 2004](#)). This has two implications: on the one hand, farmers may support vaccination because it reflects their own cultural identity of a good farmer ([Naylor et al., 2016](#); [Shortall et al., 2018](#)). On the other hand, vaccination may encourage others to adopt these biosecurity identities out of concern of being culturally different and 'letting the side down'.

Finally, in terms of the *outcomes* of the BVDP, Defra clearly framed these as social outcomes rather than outcomes relating to disease prevalence. Specifically, outcomes were identified as 'confidence' in vaccines ([Defra, 2009](#)). Framing the outcome as 'confidence' referred to the technical ability to deliver vaccination, but it also highlighted wider concerns about the loss of trust in disease control policy and biosecurity highlighted in previous social research of bTB. In this case, farmers had lost trust in the government's ability to deliver effective bTB control amongst farmers ([Enticott, 2008](#)). The ability of farmers to be involved and learn lessons about the BVDP also suggested an attempt to address levels of trust in the scientific process from which farmers had felt distanced ([Fisher, 2013](#); [Poortinga et al., 2004](#); [Heffernan et al., 2008a](#)).

Thus, the CMO configuration that the evaluation set out to evaluate was:

C – Disease environment: prevalence, institutional action, social support, farm environment
 +
M – Seeing is Believing
M – Practice similarity
 +
O – Confidence (in vaccines/biosecurity/Government)

4. Methodology

In order to analyse these CMO relationships, research was conducted in three 100km² areas, one area where badger vaccination had been deployed (the BVDP) and two comparison areas with no vaccination between 2010-14. The BVDP was based in an area of Gloucestershire, covering 100km² and containing 197 cattle herds. The area was historically a high-risk area for bTB: 50% of farms in the area had suffered a bTB incident in the previous three years. Two similar-sized non-vaccination areas were chosen to assess the impact of the BVDP upon levels of confidence. To account for variations in context, areas were chosen according to disease prevalence, historical duration of endemic bTB, numbers of dairy and beef farmers, and historical/contemporary badger culling operations. The first comparison area – Great Torrington (in Devon) – had historically high bTB prevalence. The second area – Congleton (in Cheshire) - had historically had lower but increasing bTB prevalence.

A repeat telephone survey was used to determine levels of vaccine confidence during the study period. Two telephone surveys were completed: the first in 2010 (as the BVDP was beginning) and the second in 2014 (prior to the completion of the BVDP in March 2015). Farmers were identified using a stratified random sample of cattle farms that was drawn using Animal and Plant Health Agency's bTB database. The sample was weighted in relation to farm type, surveying more dairy farms than proportionally necessary to enable comparisons between farm types (see table 1 for details). The survey was designed using a standard set of attitudinal statements relating to confidence and trust and adapted to fit the BVDP context ([Metlay, 1999](#); [Poortinga and](#)

[Pidgeon, 2003](#)). Farmers were asked about their farm's bTB status and management practices, their confidence in vaccination and their levels of trust in the Government's bTB policy. They were asked to rate attitudinal statements relating to vaccination, confidence and trust along a scale of 1 (strongly disagree) and 5 (strongly agree). The response rate for the baseline survey was 80%, and represented 229 respondents or 23% of the total population of the three case study areas. The repeat telephone survey achieved 151 responses, a response rate of 65%, representing 16.4% of the cattle farmer population in the study areas. Responses to the telephone survey were analysed in SPSS. For this paper, analysis has focused on longitudinal changes in response and variation between areas and disease contexts.

Table 1: Sample for baseline and repeat cattle farmer telephone surveys

Area		Dairy		Beef		Other		Total	
		2010	2014	2010	2014	2010	2014	2010	2014
North West Stroud	Total Population	81	66	157	180	56	4	294	250
	Number of farmers surveyed	34.6%	36.4%	24.8%	15.6%	21.4%	75.0%	26.9%	22.0%
South East of Congleton	Total Population	149	140	220	273	48	7	417	420
	Number of farmers surveyed	23.5%	17.9%	15.0%	7.7%	14.6%	14.3%	18.0%	11.2%
Great Torrington	Total Population	66	68	185	177	24	4	275	249
	Number of farmers surveyed	27.3%	19.1%	27.6%	20.3%	25.0%	0%	27.3%	19.7%
Total	Total Population	296	274	562	630	128	15	986	919
	Number of farmers surveyed	81	62	123	85	25	4	23.2%	16.4%

Note: The 'other' category includes mixed herds

Between the two surveys, three annual rounds of face-to-face interviews were carried out with a sub-sample of farmers selected from the baseline survey. Farmers were selected based on willingness to participate in further research, farm characteristics and bTB incidence, and their levels of vaccine confidence derived from survey responses. In total, 50 farmers were interviewed every year (for further details see table 2). Interviews were based around each farmer's experience of bTB and their perceptions of why they had bTB and its causes; the evolving bTB policy context; and farmers' perceptions of the governance of bTB. Interviews were fully transcribed and analysed annually in Nvivo to identify key themes in the data relating to farmers' perceptions of badger vaccination, and the underlying behavioural mechanisms for them.

Table 2: Sample of repeat farmer interviews for the badger vaccination study (Rounds 1-3, 2011-2013)

Year	Stroud	Congleton	Great Torrington	Total
2011	20	22	23	65
2012	18	18	20	56
2013	17	16	17	50

5. Theories into Action

In this section we link the contexts, mechanisms and outcomes of the BVDP. Firstly, we show how the two mechanisms are linked to contexts. Secondly, we show how these mechanisms relate to outcomes.

5.1 Contexts – Mechanisms – Outcomes (1) – ‘Seeing is Believing’

As the vaccination trial progressed, successive annual interviews with farmers provided some evidence that policy makers' expectation that the 'seeing is believing' mechanisms could trigger confidence in badger vaccination. For those farmers directly involved with the BVDP, the opportunity to watch badgers being vaccinated provided a new perspective on vaccination. Witnessing vaccination first-hand and being part of the scientific process behind the project addressed the failings they had levelled at previous scientific attempts to deal with bTB. For example, the following quote demonstrates how the authenticity and reliability of badger vaccination was derived from farmers' proximal witness to badger vaccination:

“Seeing it first-hand has made a difference. I didn't really understand it before to be honest... I didn't know how they were going to get them all. It was nice to see it done...It has given me more confidence in the job” (S307).

As predicted, context – in this case geographical proximity – was therefore a key element in triggering the 'seeing is believing' mechanism. In order to publicise badger vaccination more widely, Defra produced videos of the process of badger vaccination that were made available on government websites and featured in popular farming TV programmes. However, in areas where vaccination was not taking place, farmers were unable to dissociate their lack of trust in government with badger vaccination. On showing these films to farmers as part of the longitudinal interview process, farmers

were sceptical, struggling to accept that the badger was 'wild' and not selected specifically to make vaccination look easy. Similarly, the film reinforced questions they had on the practicality, efficacy and cost of administering a vaccination programme. These farmers demanded evidence that vaccination 'worked', for example:

"If I knew it worked, I would agree with it. But until somebody tells me it works, or shows me, then I won't agree" (C498).

The experiences of farmers in the BVDP suggested that demands for evidence were also a call for a different kind of evidence in which they were actively implicated in the production of knowledge, rather than being cast as bit part players on the margins. However, a changing political context contributed to a growing invisibility of vaccination thereby disrupting the 'seeing is believing' mechanism. Farmers had become accustomed to scientific trials to assess bTB interventions. However, whilst the BVDP had the appearance of a scientific project, its aims were wholly different: to test the practicalities of vaccination rather than assess its effect upon disease incidence. Defra had been careful to frame the BVDP as a 'project' rather than a 'trial', a nuance lost on most farmers. At the same time, politicians quickly took a view on the trial: the Minister with responsibility for bovine TB stating as soon the BVDP had begun that:

"Vaccination does not guarantee that all badgers are fully protected from infection and it would take some time to develop immunity within a local population. Vaccination is still likely to reduce disease risk and have greater disease control benefits than taking no action to tackle [bTB] in badgers...In addition, when used in combination with culling, vaccination could help to mitigate the perturbation effects of culling" ([HC, 2010](#))

A year later, the secretary of state claimed that she had 'seen [the practicalities] with my own eyes' ([HC, 2011: emphasis added](#)). If the 'seeing is believing' mechanism had worked for the minister, it ironically meant that resources would not be used to evaluate the effect of vaccination on disease incidence, frustrating the ability of the mechanism to work with farmers. Moreover, the meaning of the BVDP became malleable to suit political purposes. Set up as a trial, its contribution to BVDP became realigned to other policy objectives such as complementing a badger cull. In interviews, however, the political role that the BVDP came to occupy and its failure to provide the kinds of evidence expected by farmers resulted in frustration, as well as lower levels of trust and confidence in Government seen in the survey.

The changing political context also had implications for the seeing is believing mechanism. The BVDP was launched in 2009 by a Labour government in which farmers had come to have little confidence in matters of bTB. Following the election of the Conservative-Liberal Democrat coalition in 2010, farmers had more favourable views, suggesting they were "prepared to give this lot a go" particularly after an announcement that badger culling would be introduced. However, the postponement of this policy had a knock on effect to farmers' confidence in badger vaccination. The failure to implement this policy sustained the view that the government could not be trusted to deliver effective bTB policy. This failure also increased farmers' concerns about whether sufficient badgers could be vaccinated. As one farmer from the Great Torrington area, who has been under bTB restriction for four years, put it:

"the fact that they have realised suddenly that there is more badgers out there than they originally thought, just highlights the scale of the problem" (GT1063).

The relationship between mechanism and outcome was also situated within cultural and environmental contexts. Indeed, as the quantitative analysis shows, overall the

effect of the 'seeing is believing' mechanism in developing vaccine confidence appears to be limited (see table 3). Levels of trust and confidence amongst farmers in the BVDP did not change as a result of being exposed to badger vaccination. In general farmers in the BVDP had no different views to those farmers with no experience of vaccinating in 2010 or 2014, nor were changes over time significantly different between these two groups (see table 4). Indeed, whilst the explicit purpose of the BVDP was to demonstrate the practicality of badger vaccination, farmers in the BVDP scored the practicality of vaccination the same as in 2010. Moreover, even within the BVDP area, farmer attitudes towards badger vaccination were generally negative or ambivalent at best. In fact, confidence in vaccination became more negative in the BVDP area than non-vaccinating areas. Overall, levels of trust in Government were similar for both groups. However, by 2014, overall levels of trust amongst BVDP farmers had remained at a similar level compared with 2010, whilst trust fell in the non-vaccinating areas. BVDP farmers rated the Government as more competent, credible and with more integrity. By contrast, for those in non-vaccinating areas, responses to survey items relating to trust declined.

Table 3: Farmers' confidence in badger vaccination													
Concept	Question	All Areas				Non-Vacc BVDP				Non Vacc BVDP			
		2010	2014	Difference	Sig.	2010	2010	Difference	Sig	2014	2014	Difference	Sig
Vaccine	Badger vaccination is an acceptable way of dealing with bTB	2.89	2.53	-0.36	0.000	2.80	3.07	0.27	0.153	2.45	2.67	0.220	0.286
Acceptability	Vaccinating badgers is better than culling badgers to control bTB	2.37	2.15	-0.22	0.016	2.33	2.45	0.12	0.497	2.05	2.35	0.300	0.134
	Paying for badger vaccination should be the Government's responsibility	4.25	4.27	0.02	0.797	4.21	4.31	0.10	0.391	4.25	4.29	0.040	0.801
General Affective Evaluation	I think vaccinating badgers is a good thing to do	3.13	2.88	-0.25	0.017	2.91	3.53	0.62	0.001	2.69	3.24	0.550	0.016
	Badger vaccination will help me feel more confident about avoiding bTB restrictions	2.90	2.53	-0.37	0.000	2.82	3.04	0.22	0.268	2.49	2.60	0.110	0.617
	I am confident that badger vaccination will help prevent the spread of bTB	2.68	2.35	-0.33	0.002	2.56	2.89	0.33	0.067	2.35	2.35	0.000	0.991
Risks and Benefits	Badger vaccination will decrease levels of bTB in badgers	3.35	3.34	-0.01	0.944	3.31	3.42	0.11	0.261	3.24	3.51	0.270	0.123
	Vaccinating badgers is practical	2.37	2.23	-0.14	0.183	2.21	2.67	0.46	0.008	1.96	2.69	0.730	0.000
	Badger vaccination will reduce the chances of my herd going under bTB restrictions	3.16	2.88	-0.28	0.008	3.05	3.35	0.30	0.063	3.00	2.69	-0.310	0.118

Table 4: Farmers' trust in badger vaccination and bTB policy

		All Areas				Non-Vacc	BVDP			Non Vacc	BVDP		
		2010	2014	Difference	Sig.	2010	2010	Difference	Sig	2014	2014	Difference	Sig
Competence	The Government is doing a good job in relation to bTB	2.54	2.26	-0.28	0.017	2.78	2.11	-0.67	0.000	2.16	2.44	0.280	0.151
	The Government is organising badger vaccination competently	2.89	2.66	-0.23	0.019	2.77	3.11	0.34	0.015	2.47	2.98	0.510	0.004
	The Government has the necessary skilled people to manage badger vaccination	2.96	2.81	-0.15	0.095	2.82	3.20	0.38	0.010	2.66	3.07	0.410	0.016
Credibility	The Government does not distort the facts about bTB to make its case for badger vaccination	2.89	3.11	0.22	0.028	2.91	2.85	-0.06	0.674	2.99	3.31	0.320	0.036
	The Government does not ignore the views of scientists who disagree with them about badger vaccination	1.88	2.08	0.2	0.023	2.86	2.50	-0.36	0.120	2.82	3.19	0.370	0.022
Integrity	The Government is not too influenced by public opinion regarding badger vaccination	2.73	2.95	0.22	0.044	1.79	2.04	0.25	0.093	1.92	2.37	0.450	0.018
	The Government acknowledges mistakes it has made about bTB	2.95	2.71	-0.24	0.015	3.13	2.63	-0.5	0.003	2.83	2.50	-0.330	0.067
Reliability	The Government takes its commitments to reducing bTB seriously	3.16	3.24	0.08	0.459	3.28	2.95	-0.33	0.470	3.26	3.20	-0.060	0.762
	We can rely on the Government to ensure that badger vaccination is carried out properly	2.83	2.87	0.04	0.699	2.64	3.19	0.55	0.000	2.60	3.35	0.750	0.000
Openness	The Government is open and honest about badger vaccination	2.95	2.96	0.01	0.909	2.94	2.96	0.02	0.868	3.02	2.85	-0.170	0.241
Care	The Government is interested in what farmers think about badger vaccination	3.22	3.05	-0.17	0.126	3.24	3.19	-0.05	0.749	2.02	3.09	1.070	0.566
	The Government cares about reducing bTB	3.67	2.74	-0.930	0.000	3.76	3.52	-0.24	0.169	2.76	2.70	-0.060	0.666
Fairness	The Government considers all arguments for and against badger vaccination	3.40	3.25	-0.15	0.101	3.39	3.42	0.03	0.832	3.25	3.25	0.000	0.747
	Decisions made by the Government about bTB are fair and just	2.75	2.66	-0.09	0.394	2.87	2.53	-0.34	0.024	2.63	2.71	0.080	0.729

The failure of context to trigger the 'seeing is believing' mechanism was also attributable failings in what Weiss (1997) refers to as 'implementation theory' – the resources and activities required to trigger the seeing is believing mechanism. For farmers taking part in the BVDP, the way information was communicated was particularly important. However, farmers' contact with the team delivering vaccination varied markedly. Some farmers knew the number of badgers that had been vaccinated but others raised concerns about the level of communication they had received from scientists running the project. Some farmers claimed they had "no idea" when the last or next time badgers would be vaccinated on their farm. The importance of communication was emphasised by one farmer who proactively sought feedback:

"I always try and get them to tell me what they've caught or whatever but they say the cubs aren't around at this time because of the weather last year but um their not, I don't know really they say they're catching what is there, I'm not convinced their catching them all" (S367).

Whilst the aim of the BVDP was to create a new context in which scientists and farmers came together, these relations were highly contingent, dependent on farmers' enthusiasm to learn, chance encounters with vaccinators and local environmental conditions that determined whether vaccination actually took place or not.

5.2 Contexts – Mechanisms – Outcomes (2) – Practice Similarity

The mechanism of practice similarity relies on a supportive socio-cultural context. Interview and survey data, however, revealed that this context was rarely present and instead existing forms of good farming, social networks and farmers' own understandings of disease means that, similarities did not lead to outcomes. The failure to trigger practice similarity can therefore be seen in relation to these contexts.

The first element of practice similarity was farmers' comparison between their whole herd approach to vaccination (or disease testing) and the suggestion that not all badgers would need to be vaccinated because of the herd immunity concept ([Defra, 2009](#)). Based on their experiences of vaccinating all cattle at risk of disease, farmers argued that badger vaccination would work only if 100% of badgers were vaccinated. Farmers thought this was impractical at the scale at which the vaccine needed to be administered. While the majority were willing to accept that a single badger could be vaccinated, very few felt that it would be possible to scale-up the process that was connected to their beliefs in the over-population of badgers:

"I just can't see how they are going to know that everything is vaccinated. I don't think it's realistic to be done on the scale that it would need to be done on. I mean, bloody hell, there are thousands of them, everywhere" (C521).

Secondly, in interviews farmers consistently drew on their own experiences of vaccination and/or bTB testing to contest the likelihood of badger vaccination working. Firstly, farmers argued that vaccinating badgers – just like cattle – that were already infected was pointless. Rather, just like their treatment of cattle, badgers they argued would need to be tested to see which ones were infected (and culled) whilst the remainder were vaccinated. For example:

"Unless you're actually going to cull the infected and vaccinate the clean ones I really can't see there being a lot of benefit of it" (S300).

Farmers felt that vaccinating badgers in areas where bTB is endemic would not be effective. Instead, farmers suggested that badgers should be vaccinated in areas that are currently uninfected, particularly in areas surrounding bTB hotspots. At the same time, farmers held the view that there were simply too many badgers, that nature had been allowed to 'get out of control' by legal protections. As noted elsewhere ([Enticott, 2008](#); [Maye et al., 2014](#)), these beliefs appear to be deeply ingrained amongst farmers, forming strong social norms about what should be done about bTB. For example:

"If you know you've got a clean sett, fine, vaccinate them and then they're covered, but you need them tested first to know what we're dealing with really. What's the point of vaccinating a badger that's got TB anyway? If the cull has worked, and the badgers left are clean, fine, vaccinate them" (GT1100).

Thirdly, this failure to generate vaccine confidence was also connected to farmers own knowledge practices in which they articulated their own 'field-level epidemiology' to make sense of disease. These theories about the way bTB was transmitted were derived from their own experiences and those of other local farmers, which were collected and disseminated through their own social networks ([Fisher, 2013](#)). In the BVDP, the evidence vacuum gave these knowledge practices added significance. For example, during interviews, farmers sought to make sense of the localised spread of bTB in order to make sense of the effectiveness of vaccination:

"Even though there's the [badger] vaccination going on we've still succumbed to it [bTB]...Even though there was vaccination going on we were still going down with it and all our stock were in areas where they were being vaccinated so it may not be the answer" (S334).

Fourthly, practice similarity failed to generate confidence because of a less than supportive social environment. Farmers did not view biosecurity as a defining characteristic of a 'good farmer', such that social norms of vaccinating did not trigger the practice similarity mechanism. Similarly, farmers frequently identified their local vet as their most trusted advisor and source of information on vaccination and bTB (see Maye et al., 2017). Local vets were therefore important in contributing to firing mechanisms, yet in the BVDP they were influential in shaping farmers' attitudes against vaccination. For example:

"I've stopped it because I no longer agree with it. The more I found out about it the less I agreed with it so I stopped it. The vaccine they're using is no good. It's not suitable vaccine to even be testing. I've got 3 friends that are retired vets and they all agree that it's a total waste of time and money so I stopped it" (S389).

The result of this context – mechanism relationship can be seen in the outcomes. Farmers' general affective valuation – i.e. how they *felt* about badger vaccination, or the affect heuristic (Finucane, *et al.* 2000) – was largely ambivalent, becoming more negative by 2014 (see tables 3-4). Values for these questions however declined by 2014 and differences with 2010 were all statistically significant. Farmers' perceptions of the risks and benefits of badger vaccination reflected the pattern of initial ambivalence followed by more negative attitudes shown in their responses to questions on their affective evaluation of vaccination. Specifically, farmers were statistically significantly more likely to disagree that vaccination would reduce their herd's chances of getting bTB in 2014.

6. Discussion and Conclusion

Operationalising a theory of change approach provides lessons not just to understand the social impacts of animal disease policy, but also addresses the challenges of rural policy evaluation raised within the literature. This section discusses the broader relevance of the approach we have adopted to evaluate the BVDP. Firstly, we assess what these findings say about animal disease policy in general; secondly, we discuss the relevance and limitations of the theory of change approach to policy development; and thirdly, we link the approach to the wider critique of rural policy evaluation.

The desired social outcome of the BVDP was increased farmer confidence. Vaccine confidence levels were low to start with (in 2010; see also Enticott et al., 2014) but declined further by the end of the vaccination project. Farmers in the BVDP area were the most negative in 2014, but these impacts were felt in all research areas: lower levels of trust in government and with trust falling most sharply in the two non-BVDP areas. This research extends existing cross-sectional analyses of bTB and animal disease policies by revealing longitudinal changes in farmers' attitudes and behaviours in areas receiving different disease management interventions. Moreover, adopting a theory of change framework helps to explain why and for whom these changes have occurred by identifying the relationships between contexts, mechanisms and outcomes. The analysis focused on two CMO relationships. Firstly, 'seeing is believing' triggered social impacts through the context of geographical proximity and farmer participation in the project. Secondly, 'practice similarity' was triggered by farmers' contextual familiarity with vaccines and their cultural relevance.

From a disease policy perspective, identifying and understanding how causal mechanisms generate social impacts can help refine policy approaches to animal disease and other agricultural policy. Identifying mechanisms like 'seeing is believing' can help define the key goals for everyone involved in delivering policy. As [Weiss \(1997a\)](#) points out, policy theories are frequently implicit, yet the failure to explicitly articulate policy theory can cause problems when policy is formulated and delivered by a range of different actors and organisations. In this case, a wider appreciation of the 'seeing is believing' mechanism may have allowed for more inclusive farmer participation within the vaccination project. The idea that the BVDP was designed to test the practical application of the technology was missed by participants or viewed as a side issue, even though this was the stated aim. Some farmers in non-BVDP areas were not even aware of the BVDP, let alone its purpose; others were aware of the project but were unwilling to engage with it, which reflected their general lack of confidence in the technology. Elsewhere theory of change approaches are used as part of participatory approaches to policy development and implementation ([Apgar et al., 2017](#)). A more collaborative approach to disease control in which farmers were actively engaged in planning vaccination may have avoided these problems. Indeed, calls for more participatory approaches to policy evaluation have been made elsewhere in relation to evaluation of rural development schemes (see, for example, High and Nemes, 2007).

The failure to meaningfully and consistently trigger either mechanism also hints at the challenges facing policy theory when policy formulation, delivery and implementation are spread across a range of organisations. This is particularly relevant given the way farm animal disease policy is currently being reorganised within the *cost and responsibility sharing* agenda for animal health ([Godfray et al., 2018](#)). Whilst working in partnership is a key feature of the shared responsibility rhetoric, the extent to which this translates into focused policies with shared theories of change across all organisations is yet to be tested. A key criticism of theories of change is their apparent inability to respond to contextual changes during an evaluation ([Weiss, 1997b](#)). The development of the cost-sharing agenda during the evaluation project, along with other

political and policy changes, had the potential to affect the ability of the approach to detect and understand changes. In our case, however, the longitudinal approach allowed for new events to be incorporated into our data collection and their relationship to the two mechanisms identified fully analysed. Indeed, attempts to 'educate' farmers about the role of vaccination through the production and dissemination of films and leaflets during the project allowed us to analyse the contexts of geographical proximity in relation to the 'seeing is believing' mechanism.

The identification of CMO relationships is also integral to the ability of Theory of Change approaches to identify 'what works for whom in what circumstances' ([Pawson and Tilley, 1997](#)). In this respect, our analysis was unable to fully distinguish between those who benefitted from the vaccination policy (in terms of greater confidence) and those that didn't. This partly because the failure to generate these social impacts was felt relatively uniformly across all farmers in each of the different disease and policy contexts studied. The qualitative research did highlight some examples of how disease contexts or farm characteristics influenced the mechanisms, such as farmers who stopped vaccination because of a new bTB incident. More broadly, however, there was little sign that the geographical context of policy was influential. Proximate interventions appeared to make little difference to farmers' views towards vaccination compared to those that were delivered from a distance. If anything, farmers' attitudes in the vaccination area became more negative as the trial wore on compared to those outside it.

It may be the case that other contextual factors not fully accounted for within the analysis – such as farmers' age, or their ethical and environmental values – may have influenced the way outcomes were distributed. This highlights the significant methodological resources that are required to fully operate a theory of change approach, and the degree to which all contexts can be accounted for. Nevertheless, these findings also confirm a much broader body of theory within studies of farming behaviour relating to the role of context: that without significant disruptions to embedded cultural, environmental and economic practices, changes to farmers' behaviour are likely to be small-scale, incremental and short-lived ([Sutherland et al., 2012](#)).

It may also be the case that there are other undiscovered mechanisms at play which influence the social impacts of the BVDP: theory driven evaluation is only as good as the theories tested. Whilst this is possible, the mechanisms studied here are grounded in both an analysis of the policy itself, and the wider literature. As [Henke \(2008\)](#) shows, the visibility of experiments is a powerful influence shaping how farmers behave and innovate. Similarly, as [Wynne \(1992\)](#) forcefully shows, the visibility and involvement of farmers in scientific experiments plays a significant role in the rejection of Government policies. Perhaps more interesting is the extent to which 'seeing is believing' has wider relevance for other rural development programmes. [Pawson and Tilley \(1997\)](#) suggest that the aim of theory driven evaluation should not be excessive theory development, but to test existing theories wherever possible. For both mechanisms studied in this analysis, we therefore recommend analysing them in different contexts and for different kinds of policy to examine their broader utility in both analysing and developing rural policy.

Finally, the theory of change approach utilised in this paper also raises broader implications for rural policy evaluation, particularly EU rural policy evaluation. A focus on the CMO relationships provides a useful way for evaluators to track and monitor the resources offered to make a programme work, particularly the context mechanisms that create desirable outcomes. As noted by previous commentators ([Dax et al., 2014](#); [Dwyer et al., 2008](#); [Vanclay, 2015](#)), national programme reviews tend to favour

quantitative indicator-based evaluation strategies, aligned in the case of the Rural Development Plan (RDP) to a Common Monitoring and Evaluation Framework. These approaches appear to offer reliable data, but on their own they are not sufficient for complex programmes.

In the case of LEADER, for example, these bottom-up rural development groups are best placed to foster social innovation. A number of studies from the 2007-13 programming period now show quite clearly that evaluation approaches failed to capture their impact ([Dax and Oedl-Wieser, 2016](#)). One key delimiting factor was the design of the programme itself, which limited the ability of LAGs to support socially innovative projects. The current programme (2014-2020) appears to be equally challenging for LEADER groups, with an emphasis on measures and focus areas. Potentially, theory of change approaches to policy evaluation would be helpful in this context to capture these issues. For example, it could monitor policy design influences, the resources available to LAGs, context and delivery mechanisms and unanticipated factors linked to outcomes. At a programme-level, this requires a shift in what constitutes creditable and legitimate knowledge, recognising much more the power of robust qualitative measures, including the value of story-based approaches and narrative evaluation (Vanclay, 2015), alongside quantitative techniques.

The failure of rural policy evaluation to capture process-related and intangible impacts also extends beyond LEADER. Agri-environmental measures are another well-established element of RDPs, but often it is difficult in formal evaluations to measure the impact that their involvement has on farmer behaviour and identity, particularly over a sustained period. From a territorial perspective, RDP support measures and focus areas (e.g. farm succession and generational renewal) also have impacts and outcomes linked to contextual factors that defy measurement via output indicators. EU schemes have 'complex realities', as noted in relation to schemes that use environmental management to support community development ([Prager et al., 2015](#)).

At the same time, the theory of change approach can help address the lack of active participation of actors in the evaluation process, particularly to establish appropriate goals and success criteria. The alignment of theory driven approaches with participatory approaches to rural policy development and evaluation ([Apgar et al., 2017](#)) allows these approaches to compliment the bottom-up approaches to rural development such as the EU's LEADER scheme, addressing the current mismatch in bottom-up development and top-down evaluation approaches ([High and Nemes, 2007](#)). This is important given the proposal in the next RDP that member states will have flexibility to determine their national programmes (for both pillars) but they must closely monitor performance outcomes ([Hogan, 2018](#); [European Commission, 2018](#)). As the EU's rural development programme continues to evolve and become more flexible across its two pillars, theory driven approaches to evaluation can play a valuable role in meeting the needs of rural policy makers.

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