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A RESET of dairy farmer animal health planning behaviour: symbiotic advisory relationships and knowledge brokering in HerdAdvance

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ABSTRACT

Purpose: To evaluate the success of behavioural interventions designed to improve preventative animal health planning by dairy farmers in Wales.

Methods: Interviews of farmers, veterinarians; focus group with extension officers; post-hoc written reflections from project managers; survey of farmers and veterinarians; farmer dropout analysis.

Findings: The combination of interventions inspired by the RESET model of behavioural change helped farmers to implement new animal health planning behaviours. Crucial to the success of the project was the brokering role of extension agents and curation of AKIS relationships by project managers. This led to the establishment of symbiotic relationships which helped to deliver successful behavioural interventions.

Practical implications: Illustrates the need for strong project and AKIS management to deliver combined behavioural interventions to farmers. It also demonstrates the danger of narrow evaluation methods which fail to delve deeper into the symbiotic relationships needed to deliver interventions in practice.

Theoretical implications: Adds empirical evidence to an integrated behavioural change model (RESET) and explicitly connects the concepts of knowledge brokering and social capital with successful delivery of behavioural change.



Originality: (1) Contributes novel empirical evidence on how to effect farmer behaviour change based on a large-scale national project. (2) explicitly highlights knowledge brokering, social capital, and good project management as crucial to delivering behavioural change projects, (3) reflects on the value of mixed method evaluations of behavioural change projects.


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1. Introduction

To make sustainable transitions in agriculture, farmers will need to do things differently; for example, adopt new technologies, implement new practices, and adapt their businesses in other ways (de Boon, Sandström, and Rose 2024). Ultimately, this requires changes in human behaviour to make different decisions. This paper evaluates the success of the HerdAdvance project, which used a range of behavioural interventions to improve the practice of preventative animal health planning for 500 dairy farmers in Wales (UK). In doing so, the paper draws on two main strands of literature; firstly, research on farmer behaviour change informed by the use of various behavioural frameworks, and secondly insights on knowledge brokering and the linking of social capital developed in papers on agricultural knowledge and innovation systems. Combining these literatures showcases the importance of both interventions and people in facilitating farmer behaviour change, as well as the vital co-ordinating role played by project managers.

Referring first to the burgeoning literature on changing the behaviour of farmers, a number of frameworks have been developed to inform the delivery of interventions (e.g. see Rose, Keating, and Morris 2018). These include the Theory of Planned Behaviour (e.g. Hall, Turner, and Kilpatrick 2019; Sambodo and Nuthall 2010), the Theory of Reasoned Action (see Sok et al. 2021), the Behaviour Change Wheel (COM-B, see Biesheuvel et al. 2021), self-determination theory (Charatsari, Lioutas, and Koutsouris 2017), motivational interviewing (Baker et al., 2021), amongst many more (see Rose, Keating, and Morris 2018). They have been applied to explain or change farmer behaviour in various contexts, including motivations to join agri-environment schemes (Coyne et al. 2021; Mills et al. 2017) or perform other pro-environmental behaviours (Daxini et al. 2019), reduce anti-microbial use (Lam, Jansen, and Wessels 2017), undertake proactive animal health planning (Ellis-Iversen et al. 2010; Lahuerta-Marin et al. 2018), address animal disease (Biesheuvel et al. 2021) or make animal welfare improvements (Carroll and Groarke 2019). A review of the behavioural change literature applied to agricultural contexts has also suggested that long-term evaluations of projects are lacking, as well as a critical reflection on how and why participants may drop out over the course of the project (Rose, Keating, and Morris 2018).

In this paper, we choose to focus on the RESET model of behavioural change because this primarily informed the design of interventions used in the HerdAdvance project,¹ outlined in the methodology. The RESET framework of behavioural change argues that five types of intervention – rules, economics, social norms, education, and tools – work together to create the conditions for change (Lam, Jansen, and Wessels 2017). The combination of interventions is important; for example, economic incentives are not helpful if farmers don't understand (education) how to perform an action, whilst knowing how to do something is useless if there is no incentive to act on it. This framework has been successfully applied to change the antibiotic prescribing behaviour of veterinarians in The Netherlands (Lam, Jansen, and Wessels 2017). There is evidence from the literature that each of the components of the RESET model help to change farmer behaviour. Clear rules and objectives were found to be important in helping veterinarians to understand what was expected of them in the Lam, Jansen, and Wessels (2017) study. Australia has been one of the only countries to eradicate bovine

tuberculosis through a strict regulatory scheme and transparent standards (More, Radunz, and Glanville 2015). Both industry and government were aligned on what the desired outcome was and objective measures of progress were used to determine how close they were to eradication.

Economic incentives and proving cost–benefit even in the absence of ongoing incentives, are crucial to prolonged behaviour change. For example, Mohr et al. (2020) found that farmers would only use diagnostic tests for sheep scab if there was a cost–benefit of doing so and participation in a pig health project was found to be low if farmers were not convinced of economic benefit (Alarcon et al. 2014). The level of initial investment in measures to control disease is also important (Tunstall et al. 2019). A literature review of Bovine Viral Diarrhea (BVD) control measures focused on Ireland found that reducing the economic impact of infections was the primary motivation for farmers engaging in schemes (Barrett et al. 2011). In order to prove to a farmer that reducing infection leads to economic benefits, data collection is crucial (Teixeira-Costa et al. 2020). This helps farmers to understand the scale and costs of diseases, such as lameness, in their herds and the benefits of taking preventative action (Bennett et al., 2014).

Changing social norms is a key determinant of farmer behaviour with regards to disease control behaviours. Reporting on schemes to control BVD in South Australia, Lanyon, Anderson, and Reichel (2017) noted low farmer compliance in signing up to the scheme because awareness was low and hence there was minimal social pressure for farmers to sign up. Similarly, in a paper on general disease control, farmer perceptions of how others controlled the disease strongly predicted whether they would adopt the same behaviours or not (Mingolla et al. 2019). Farmers with higher social capital, in other words, more connections with peers and advisors, were found to be more likely informed by others in the control of Johne’s disease (McAloon et al. 2017) and more likely to milk record (Dillon, Hennessy, and Cullinan 2015).

Knowledge (related to education) of dealing with animal disease, including of current legislation, was strongly correlated with higher performance in several studies (Dutton-Register et al. 2019; Liu et al. 2018; O’Kane et al. 2017). For control of BVD in Australia, those farmers who regularly quarantined new stock or isolated stock after a positive test were found to have a higher perceived understanding and knowledge of the virus; knowledge was also higher for farmers who were in an assurance scheme, or if they had attended a seminar on the subject (Lanyon, Anderson, and Reichel 2017).

Supporting tools reinforce education that has been provided (Rose, Keating, and Morris 2018). For example, the promotion of milking gloves in the Netherlands made it easier for farmers to improve cows’ udder health by requiring a single change in their management practices (Jansen, Renes, and Lam 2010). Though the farmer behavioural change literature primarily places the emphasis on the interventions themselves, research explicitly highlights the role of people, notably trusted advisors, in facilitating change. In the context of livestock health and welfare, for example, research has found that farmers’ own veterinarians are the most trusted source of advice and key to behavioural change through their advisory role (Bellet et al. 2015; Ellis-Iversen et al. 2010; Enticott 2023; Lahuerta-Marin et al. 2018; Speksnijder and Wagenaar 2018).

Making the link between the design of behavioural change interventions and the people needed to deliver them leads us to research on agricultural knowledge and innovation systems (AKIS). Though there is not always an explicit acknowledgement of

AKIS-drawn concepts of knowledge brokering and social capital in papers on farmer behaviour change, advances made in the AKIS research field over the last thirty years help us to identify crucial components of a likely successful behavioural change project. After all, the process of innovation, which is at the core of AKIS research, is fundamentally about a farmer or other system actor doing something differently, in other words, changing behaviour.

Scholarship on the AKIS is plentiful and continually evolving. In essence, seminal research in the field advanced the concept that farmers make decisions in collaboration with several other AKIS actors, such as agronomists, veterinarians, land agents, supply chain actors, and others, and based on various sources of knowledge, including from peers, research, and agri-business organisations (Davis 2019; Knierim and Prager 2015; Röling 1990; Sutherland et al. 2023). Traditional extension actors, such as farm advisors, always sit within a wider AKIS (Klerkx et al. 2017). Over time, the AKIS concept has evolved and one definition describes it as ‘a system of innovation, with emphasis on the organisations involved, the links and interactions between them, the institutional infrastructure with its incentives and budget mechanisms’ (EU SCAR 2019, 13). The concept has informed the multi-actor approach of organisations like the European Union. Further advances have moved scholars away from viewing the AKIS as merely a top-down approach, instead recognising the presence of a microAKIS and the ‘knowledge systems that farmers personally assemble, including the range of individuals and organisations from whom they seek services and exchange knowledge, and the processes involved in the formation and working of the system, including the way farmers translate these resources into innovative activities (or not)’ (Sutherland and Labarthe 2022, 531; Sutherland et al. 2023).

For effective innovation, links are needed between the people and sources of knowledge within the AKIS (Hall and Pretty 2008). Cofré-Bravo, Klerkx, and Engler (2019) identify three types of social capital needed to connect people in the AKIS: bonding social capital which links similar people together (e.g. farmers with other farmers), bridging social capital which connects different AKIS actors together (e.g. farmers with extensionists), and linking social capital which refers to the institutional environment within which AKIS actors operate (e.g. government agencies, research centres, and the policies and ideas emanating from them). Research suggests that close connections between farmers and their peers, plus farmers and extensionists (and other system actors), can stimulate learning and innovation, if wider institutional arrangements and policy instruments enable change to occur (Klerkx et al. 2017). Research shows that where farmers are ‘surrounded by networks of different complementary advisors’, more integrated forms of knowledge and support are available for farmers to innovate (Klerkx et al. 2017, 216), perhaps creating a situation in which a system can work ‘optimally and synergistically’ to achieve ‘more than ... its individual parts’ (Germundsson 2021). Trusted and knowledgeable individuals or organisations can play a brokering role to connect groups of heterogeneous or homogenous actors (Klerkx et al. 2017; Tisenkopfs et al. 2015). Where there is fragmentation in the AKIS, for example a disconnect between farmer peers, between farmers and sources of advice, or between the willingness and capacity to innovation, behavioural change can be difficult.

With this literature in mind, we evaluate a large-scale farmer behaviour change project, HerdAdvance, in Wales. This project aimed at improving preventative animal

health management involved multiple AKIS actors, including farmers, veterinarians, extension officers, project managers, and organisations conducting disease testing. We focus here on three main research questions:

1. What were the reasons for farmer dropout during HerdAdvance?
2. How and which behavioural interventions helped farmers implement new behaviours?
3. What challenges affected (and will affect in future) farmer implementation of new behaviours and what lessons can be learned for the future?

From these questions, we make empirical and methodological contributions, as well as outlining key policy recommendations for the successful delivery of future farmer behavioural change projects. Specifically, we offer further empirical validation of the RESET framework of behavioural change applied in the context of farmer decision-making. In conducting this evaluation, we also highlight the value of mixed methods approaches to project evaluation so that the impact of a combination of interventions, people, and the co-ordination of both, can be properly understood. Through the application of more in-depth qualitative methods and a wider stakeholder pool, some of the ‘unseen’ work crucial to successful project delivery can be brought to the surface, and we focus our policy recommendations on this point.

2. Methodology

2.1 The HerdAdvance project

Reflecting on lessons learned in European projects, which assessed the connectedness of the AKIS across European countries, Sutherland et al. (2023) notes that advisory arrangements in the UK are fragmented. In the UK, and its constituent devolved nations (England, Northern Ireland, Scotland, Wales), agricultural advice is mainly privatised, leading to disconnection between sources of knowledge and innovation support.

In 2018, Welsh Government awarded £6.5 million from the Rural Development Programme (EU Commission) to the Agriculture and Horticulture Development Board (AHDB) to deliver a programme to improve the health of the Welsh dairy herd and perform other activity (e.g. Strategic Dairy Farms and Environment work). The AHDB is a levy organisation. In return for receiving a levy from farm businesses, the AHDB offers a range of services that individual farms would not be able to pay for – including extension, market insights, business development etc. This organisation led the HerdAdvance project which worked with approximately 500 dairy farmers in Wales (c 1/3 of the entire Welsh dairy herd) for three years, with cohorts starting at different times (not before June 2018 and not finishing after June 2023).

HerdAdvance aimed to improve the preventative animal health planning of dairy farmers in various areas – lameness and foot health, mastitis control, Johnne’s disease and other endemic infectious diseases of cattle (Leptospirosis, Infectious Bovine Rhinotracheitis (IBR) virus, *Fasciola hepatica* infection (liver fluke) and *Neospora caninum* infection), genetics and genomic improvement, calf health and young stock

management, and housing. Some major diseases such as Bovine Viral Diarrhoea (BVD) virus and bovine tuberculosis (bTB) were not covered by this programme. Ultimately, the aim was to encourage farmers to undertake preventative animal health management, rather than being reactive when issues arose.

An open call was made to recruit 500 dairy farmers in HerdAdvance. The *rules* of the project were as follows:

1. An AHDB regional extension officer visited each farm to collect baseline data on health performance across all of the areas covered in the project.
2. The extension officer visited with the farmer's own veterinarian at the start of Year 1 and Year 3 to review herd health and biosecurity plans.
3. In agreement with the veterinarian and extension officer, each farmer could pick up to three priority disease areas over the course of the project (one per year).
4. An action plan was agreed between these three parties which had to be implemented.
5. The extension officer assisted in the continued collection of data throughout the project and facilitated keeping the farmer on track with the action plan.

The following interventions were offered to farmers:

1. Free data collection and extension from AHDB officers throughout the three years in-person and on the phone (*education, economics*).
2. Two free visits from veterinarians (*education, economics*).
3. Free extension support from a livestock housing expert if needed (*education, economics*).
4. Free testing for certain diseases (e.g. Johne's, *economics, education*).
5. Farmer peer-to-peer focus groups comprised of those involved in HerdAdvance to share experiences [heavily disrupted due to COVID] (*social norms, education*).
6. Supporting tools to help farmers implement action plans (e.g. mobility scoring charts for lameness, *tools*).

As shown above, it is acknowledged that some interventions cover multiple RESET categories.

The AHDB designed the project, including its combination of interventions, without the direct input of the authors listed on this manuscript. Their approach was informed by a review of literature on farmer behavioural change conducted in 2018 by the lead author (Rose, Keating, and Morris 2018) and other work that the AHDB was involved with, the latter of which led them to design the project in sympathy with the RESET model of behavioural change. This is the reason why the introduction and results evaluate behaviour change using the RESET model, as opposed to other relevant models such as the Theory of Planned Behaviour. The lead author of this paper was asked for feedback at the start of the HerdAdvance project about the design of interventions (but not before the project had been designed), which did not change how the project was delivered. The author team were, therefore, independent from its design and execution.

The project involved several different AKIS actors – primarily farmers, veterinarians, AHDB extension officers, an animal housing expert, AHDB project managers, and organisations who carried out disease testing. AHDB extension officers and project managers

liaised with each actor involved in the project to ensure meetings were held on time, free tests delivered, and to offer support to farmers and veterinarians during and after farm meetings.² Lockdowns associated with COVID-19 affected the ability for some of these meetings, and for farmer peer focus groups, to meet face-to-face in certain periods. In total, 517 farmers started the project with 489 completing a second data collection visit (start of Year 2), and 404 farmers completing a third data collection visit (start of Year 3).³ In addition, 45 vet practices participated. We acknowledge that the project is an example of a relatively simplified top-down AKIS and that the highlighted actors above sit within a wider innovation network. Health performance and cost-benefit analysis were undertaken by a different research team and thus are not the focus of this paper.⁴

2.2 Methodological approach

Our methodology for evaluation was guided by three principles; firstly, to combine quantitative and qualitative methods in order to gain a rich insight into how HerdAdvance worked in practice; secondly, to include a range of stakeholders involved in the project – farmers, veterinarians, AHDB extension officers, and project managers; and thirdly, to be pragmatic and collect as much data as possible in the context of restrictions imposed by the nature of HerdAdvance. Farmers and veterinarians in the project already faced demands associated with project participation and additional involvement in evaluations being conducted by third parties in relation to disease outcomes and cost-benefit analysis. We also note that the Welsh Government/AHDB designed the project so that all participating farmers could benefit from the range of behavioural interventions, so it was not a typical behavioural experiment with control and intervention groups needed to isolate the specific variables associated with change. Our evaluation was not interested per se in asking whether farmers made changes on the farm because they were required to follow the jointly written management plan agreed with their veterinarian to receive continuing support. We used the following combination of methods:

1. Farmer dropout analysis (2.3) to answer the first research question focusing on reasons why farmers dropped out of the project, before or after starting.
2. Survey and interviews of farmers (2.4), and surveys/interviews of veterinarians (2.5), to answer the second and third research questions focusing on effectiveness of behavioural interventions, challenges, and lessons for the future (though insights were also gained for the first research question).
3. A focus group involving AHDB extension officers, and a post-hoc written reflection from AHDB project managers (2.6), to focus on all of the research questions, but particularly lessons learned for future project delivery (relevant for the AHDB and other institutions around the world interested in running farmer behaviour change projects).

Ethical approval was first granted by the original institution at which the grant was won (University of Reading) and by Cranfield University.

2.3 Farmer dropout analysis

Many previous studies of farmer behaviour change have not recorded reasons for farmers dropping out (Rose, Keating, and Morris 2018), but collecting such data is important to

enable lessons to be learned for future delivery of similar projects. Project officers from the AHDB were asked to establish an excel spreadsheet recording numbers of farmer dropouts before (i.e. the farmer had registered an interest in joining but did not start) and during (i.e. the farmer started the project but did not finish) the project. AHDB project managers tried multiple ways of contacting farmers to explore reasons for dropping out, from emails to phone calls, but farmers did not have to provide a reason. Due to staff changes at the AHDB, the spreadsheet was not kept up to date until the end of the project and not all dropouts were contacted. The AHDB attempted to make contact with 151 farmers who registered an interest in the project, but did not start.⁵ They also attempted to contact 42 farmers who started but dropped out during the project. This is less than the 113 farmers that left the project between commencement and the start of the final year. If reasons were given for not starting or dropping out mid-project, they were thematically coded to provide an assessment of the main types of reason for lack of continued participation.

2.4 Farmer surveys and interviews

We undertook two online surveys (Qualtrics) of farmers involved in the project. We did not choose to use hard copies due to the administrative and practical burden for the AHDB or farmers in distributing and collecting/returning responses. Open-ended answers were coded thematically and analysed, whilst descriptive statistics were used for close-ended answers.

The first survey (appendix 1) was filled in by farmers during their involvement in the project and asked about their experiences of the project. This was focused on what was or was not working in terms of assisting behavioural change. Generally, it did not necessarily matter how long farmers had been involved in the project at the point of response because their three-year involvement was essentially split into individual years with a different priority disease area per year. Farmers had been involved for at least six months before filling out the survey giving their perspectives. It consisted of 20 close- and open-ended questions and was offered in Welsh or English. It was distributed to farmers by the AHDB through email and via the AHDB extension officers. During the course of the project, 169 farmers filled in this survey, representing around a third of participants.⁶

A second survey (appendix 2) consisting of nine closed-ended questions was developed for farmers who had finished the project at least one month ago. This was focused more on the legacy of the project. Close-ended questions were developed here because the AHDB firstly distributed this survey at an agricultural show which required farmers in the project to fill in the survey on an iPad at the event, which made it difficult to give long answers. After the event, the survey was distributed by the AHDB via email to farmers who had finished the project. In total, 54 responses were gained. Sample characteristics for both surveys are provided in appendices 1 and 2.

Semi-structured interviews were carried out (by JB) with five farmers asking for their experiences of the project (see topic guide, appendix 3). These farmers were identified by the AHDB, which in hindsight could potentially risk selection bias, but there was no evidence that the most 'project-positive' farmers were selected since criticisms were raised in the discussions. These interviews were conducted face-to-face on farm to capture farmer

experiences of participating in the project as a whole, specifically around reasons for selecting action plans in particular areas of herd health and recommendations if participating in this type of project in future. Notes were taken during the interview and these were analysed thematically thereafter.

2.5 Veterinarian survey and interviews

Veterinarians played a key role in HerdAdvance. An online Qualtrics survey in English and Welsh was distributed via an online link sent to vet practices involved in HerdAdvance (appendix 4). In total, 27 veterinarians responded to the survey across different regions of Wales, but two of these did not answer beyond the first 3 questions (region, most effective interventions, and barriers). AHDB project officers believe that at least 60 veterinarians were actively involved in the project across 45 vet practices, but it is difficult to be sure of the total number. Close-ended answers were analysed through descriptive statistics whilst open-ended answers were thematically coded.

A request to participate in semi-structured interviews was circulated by the AHDB to participating vet practices. These were undertaken by two researchers (JS and JB). Due to contracting rules, JS and JB worked separately as they were working on different internal deliverables for the AHDB. However, their approach was similar, i.e. both asked veterinarians about their experiences of being involved in the project and so the data were combined in this paper. JS interviewed seven veterinarians online about their experiences of the project (appendix 5.1) lasting around 30 min, contacted from a list of participating vet practices provided by the AHDB, whilst JB interviewed the five veterinarians who had worked with the five farmers interviewed (2.4); three face to face meetings, one online and one via telephone call, each lasting around 60–90 min (appendix 5.2). Interviews by JS were audio-recorded and transcribed verbatim, whilst JB made notes during the interview, and both were analysed thematically for inclusion in the paper.

2.6 Focus group and reflections from AHDB extension officers and managers

AHDB extension played a key brokering role in the project, liaising regularly with participating farmers, veterinarians, and third parties. We undertook one focus group with five of these extension officers, plus an AHDB project manager, mid-way through HerdAdvance to gain their insights on the three research questions (topic guide in appendix 6). There were five extension officers working across Wales at any one time (some were replaced during the project). The focus group was conducted online due to COVID-19 restrictions and lasted an hour. It was audio recorded, transcribed, and manually thematically analysed through coding. We also asked two AHDB project managers to send a list of written bullet points after the end of the project, reflecting on what had worked well and not so well.

3. Results and discussion

The results below are laid out in relation to each of the three research questions. Since most of the methods addressed multiple research questions, the sources of evidence in

each section are varied. To simplify for the reader, the following consistent nomenclature is used:

1. 'Farmer dropout analysis': refers to the recording of reasons for dropout collected into an excel spreadsheet and analysed.
2. 'Farmer mid-project survey': refers to the survey answered by 169 farmers during HerdAdvance.
3. 'Farmer post-project survey': refers to the survey answered by 54 farmers after finishing HerdAdvance.
4. 'Farmer interview': refers to the five farmer interviews.
5. 'Vet interview JS' or 'Vet Interview JB': refers to the interviews carried out by either of the co-authors listed via initials.
6. 'Vet survey': refers to the online survey filled in by 27 veterinarians.
7. 'Extension officer focus group': refers to the focus group carried out with AHDB extension officers.
8. 'Project manager reflections': refers to written post-project reflections from AHDB project managers.

3.1 Farmer dropout analysis (RQ1)

From the 'farmer dropout analysis', the AHDB (extension officers and project managers) attempted to contact 151 farmers who registered an interest in HerdAdvance, but did not start. It was not possible to ascertain a reason (no or unclear response) for 94 of these farmers. We note the caveat of not being able to ascertain the reasoning of most farmers who did not start the project or dropped out, but we still see value in the data we were able to collect. Of the remaining 57 farmers, the main four reasons given were: no perceived benefit (15), succession or business issues restricting a three-year commitment (14), bad timing (illness, too busy, other priorities) (13), too much involved (data collection, paperwork) (9).

The AHDB attempted to contact 42 of the farmers who dropped out during the course of the HerdAdvance project. For 12 farmers, their reasoning was unclear⁷ or there was no response, whilst some farmers gave multiple reasons. Of the 30 farmers who gave a response, most (19) dropped out of the project for an external and uncontrollable reason (e.g. leaving dairying, death, succession). Ten farmers said they had left HerdAdvance because they did not perceive a benefit and one criticised the running of the project, whilst two complained about the burden of too much data collection and two said the timing was not right for continued participation.

Evidence from the 'vet interviews', 'farmer mid-project survey', 'vet survey', and the 'extension officer focus group' also supports the dropout findings around lack of perceived benefit. One of the veterinarian interviews (*Vet interview JB, 4*) in the project encapsulated the need to balance '*immediate gratification*' (or '*free stuff*') with sustained participation. Though 76% of farmers in the 'farmer mid-project survey' (n = 169) said that new practices had benefitted their farm, 21% answered 'maybe', perhaps indicating that impacts were not immediately obvious. Furthermore, in the 'vet survey' 48% of veterinarians (n = 27) said that a barrier to implementation was a farmer not being

convinced a practice would be beneficial. Using their in-depth knowledge of working one-to-one with farmers, the AHDB extension officers (focus group) contributed further thoughts on reasons for dropout, including on:

1. Lack of perceived benefits: *'I've had farms that have dropped off after a vet visit as they have said they don't feel there's enough benefit in the project, and then I've had farms that have dropped off that have gone through priority areas and haven't seen enough benefit in the priority area that they chose and have then disregarded the entire project and dropped off because of that'.*
2. Time to collect data: *'I've had some farms drop out right from the start if they didn't want to collect data. It was too hard and they dropped off right at the start'.*
3. Lack of ability to commit long-term: *'one farmer that I went out and did the first visit and arrange the vet visit with, he was getting towards retirement age and I think he just lost all motivation in farming altogether and then he rang me and said I probably will sell the whole herd within a year so he wasn't motivated to improve'.*

Reflecting on four main reasons given above for dropout, the lack of perceived benefits was the major driver of non-participation in the project after registering interest. For many issues in agriculture, including animal disease, the beneficial effects of interventions are rarely immediately obvious. This is true for many of the health areas covered in HerdAdvance, including Johne's Disease, where farmer perceptions around control of the disease firstly depend on perceived importance in the herd (Ritter et al. 2016) and despite control programmes in many countries, knowledge gaps remain, partly related to limitations to study outcomes over a long period of time (Barkema et al. 2018). The control of mastitis in dairy herds is another good example – generally a number of interventions are required (Green et al. 2007) but these can be complex to manage and require time for a sustained reduction in the incidence rate of new disease to become apparent.

Looking at succession or business issues which restricted the ability of farmers to make long-term commitments to a behavioural change project, this is unsurprising with the volatility of dairying (and other enterprises) and the challenges of succession (see e.g. RABI 2021). A major survey of English and Welsh farmers in 2021 found that 39% of dairy farmers were probably or possibly depressed (RABI 2021). Across the UK the number of dairy producers has fallen sharply by 67% from 35,700 in 1995 to 11,900 in 2020 (Uberoi 2021). A recent survey of 600 dairy farmers by the National Farmers' Union found that over 30% of producers were likely or unsure about continuing beyond 2025.

Two other reasons mentioned for dropout can be linked together; the time needed to participate in the project and other competing priorities on the farm, whether business- or social-related. Research has consistently found that the burden of administration and project membership can affect the willingness of farmers to participate in the context of busy and unpredictable farm work and various factors, including time and lack of trust, can affect interest in working with government or other AKIS providers (Hurley et al. 2022).

3.2 The effect of RESET interventions

The introduction to this paper illustrated the complementarity of the literature on behavioural change and the AKIS, highlighting that facilitating change is a function of effective physical interventions, combined with the people needed to implement them, which is underpinned by how connected people are. Before exploring factors behind behavioural change, it is noted that farmer actions and disease outcomes were not part of our evaluation. However, there is evidence that the project was well-received. In the ‘farmer mid-project survey’ ($n = 169$), 80% of farmers said that HerdAdvance had matched or exceeded their expectations with a further 18% having their expectations partially matched (survey 1, $n = 169$). In the same survey, 80% had observed animal husbandry improvements, 57% economic benefits, and 34% reported greater confidence in trying new things. Open-ended feedback from the same survey was overwhelmingly positive with quotes including, ‘it did what it said on the tin’, and ‘it was of more value practically than expected’.

The rest of Section 3.2 starts by focusing on the interventions themselves, before spending more time analysing how and why they were successfully implemented.

3.2.1 Most helpful interventions

In the ‘mid-project survey’, we asked farmers during the project about the type of interventions that were helpful in the implementation of agreed action plans to enhance preventative animal health planning. Figure 1 illustrates that three types of intervention were rated as most helpful: advice from the veterinarian, financial incentives (e.g. free disease testing), and data collection. These mostly cover the ‘economics’ and ‘education’ parts of the RESET model. Nearly 30% of farmers found a supporting tool helpful.

Open-ended ‘farmer mid-project survey’ comments supported the value of financial incentives, data collection, and free vet visits:

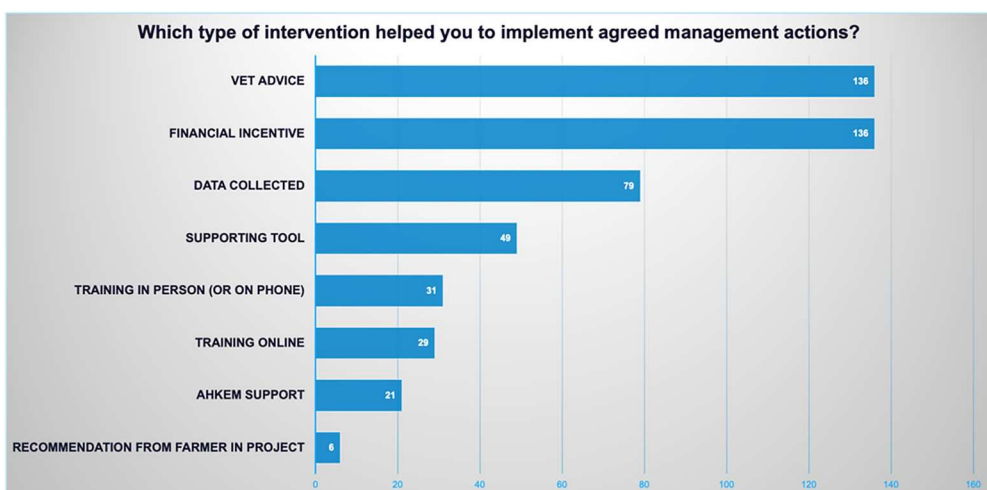


Figure 1. Most helpful interventions rated by farmers in mid-project survey ($n = 169$ – 3 farmers filled in post-project). ‘AHKEM Support’ refers to AHDB Extension Officer.

The data enabled me to reassess the entire herd and select the most valuable cows to breed from. It helped identify our weaknesses and offered a way to solve them.

Increased testing for Johne's results in more data and better decisions.

We have learnt a lot, spent more time with our vet, watched webinars.

In line with the emphasis on combining complementary interventions, feedback from 'vet interviews' showed how HerdAdvance interventions worked together to create change. For example, all of the seven veterinarians interviewed by JS noted how data collected by the AHDB extension officer (referred to as 'AHKEM', 'animal health knowledge exchange manager', in [Figure 1](#)) had underpinned and improved their own advice to farmers:

I think we definitely use more data as a result of the project because they had to provide the data to the KEMs [extension officer] more often. So, it's become a more routine part of the discussion that we're analysing the data and looking at what they've got. So, instead of guessing things when we've actually got the hard facts in front of us. (Vet interview JS, 6)

One thing that was really useful was actually the AHDB person collecting the performance data for that farm, that's been really useful particularly in areas where the data wasn't readily available, so that's been really useful. (Vet interview JS, 3)

Having the vet visits covered financially also helped to establish better farmer-vet relationships as a result of being able to talk and plan without worrying about the cost:

... you feel that because the costs are covered, you can really go into greater detail in things that you can really spend more time talking to the farmer. (Vet interview JS,2)

HerdAdvance has allowed preventative health projects on farm that often farmers are reluctant to pay for, but actually benefit the farmer and animal health. (Vet survey)

... allowed us to get involved with work that we wouldn't normally have done. (Vet survey)

... it has been a benefit to me and my colleagues because we've been able to do things and to do things on more farms and do things to a better standard on more farms than we would have without it. (Vet interview JS, 4)

In the 'farmer post-project survey', we also asked those who had finished the project at least one month before what had been helpful in continuing HerdAdvance practices post-project (i.e. the 52 out of 54 farmers who said they had continued HerdAdvance-style health planning). [Figure 2](#) (n = 52) illustrates that many different factors – data collection, industry standards requiring practices, better relationship with the vet, more confidence in proactive planning, more awareness of where to find support, and greater knowledge – were helpful. These factors cross-cut the RESET model with rules and social norms addressed by the industry requiring certain practices to be followed (e.g. testing for certain diseases), data collection showing benefits to the farm (including likely economic benefits), and enhanced confidence and connection with their vet and other sources of support improving education and knowledge about preventative planning. These results provide further validation to the RESET model and particularly the key point that different types of interventions work in combination to encourage change.

These results support findings from the literature on farmer behaviour change, especially papers which discuss how to sustain long-term behaviour change after a

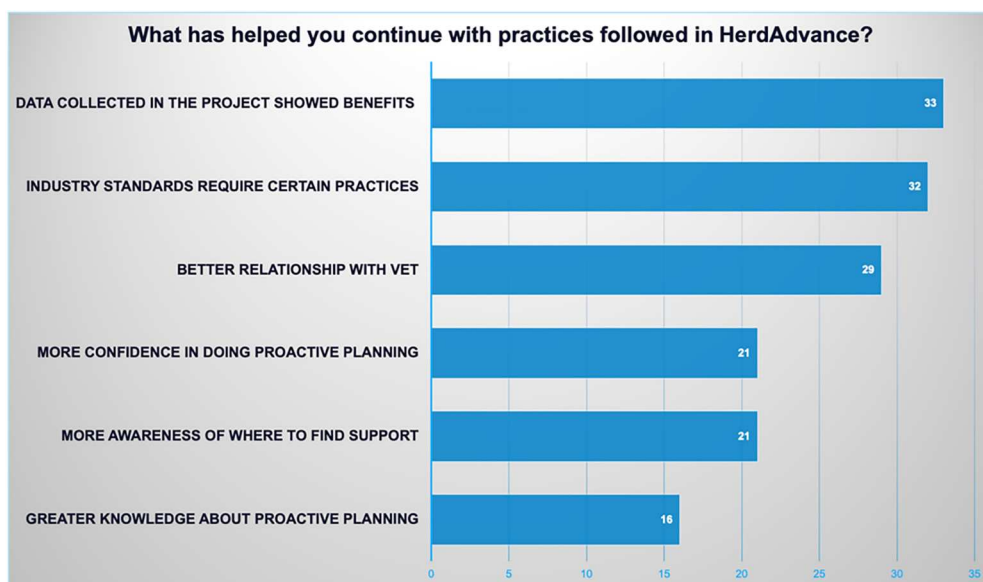


Figure 2. Factors helping continuation of HerdAdvance behaviours post-project ($n = 52$).

project ends (see Rose, Keating, and Morris 2018). Though there are a lack of long-term behavioural studies in farming that follow participants long after project interventions have ended (Rose, Keating, and Morris 2018), to achieve sustained change, there is a need to prove the benefits of change for a farmer, as well as implementing conditions to sustain practices, such as industry standards and support from advisers and extension officers (Gatto, Mozzato, and Defrancesco 2019).

3.2.2 Interventions, people, connections

During the project, interventions related to economics and education were particularly helpful, with supporting tools also being useful to some farmers. However, closer analysis of Figure 1 is required in the context of qualitative data which shed further light on how these interventions enabled farmers to change animal health planning behaviour. In the simplified AKIS of HerdAdvance, major players involved in delivery included: farmers, veterinarians, AHDB extension officers, an animal housing expert, AHDB project managers, and people in organisations who carried out disease testing.

As with all interventions, the top three most helpful project interventions – vet advice, financial incentives (e.g. free testing), and data collection – could not have been implemented without the work of people involved in HerdAdvance. Meetings with the veterinarians required a farmer, vet, and extension officer to arrange a time and place to meet, and to attend on time. Free disease testing involved co-ordination between farmers, vets and/or AHDB extension officers, and people in third-party organisations doing the testing. Regular data collection on the farm involved the AHDB extension officer meeting with the farmer and spending time doing the collection. On the specialist subject of animal housing, an additional housing expert was brought in to accompany the vet and extension officer on a farmer visit.



Figure 3. The AHDB extension officer (left) mediating the meeting between veterinarian (right) and farmer (centre). Photo included with kind permission of the AHDB.

It was apparent from several sources of evidence that AHDB extension officers played a key role in co-ordinating people and interventions. Both veterinarians and farmers noted the crucial brokering role of the extension officer who was present at farmer-vet meetings in the project. [Figure 3](#) illustrates the typical way in which AHDB extension officers participated in the meeting, acting as a broker, offering support to both parties during and after the meeting, as well as making sure both parties attended appointments on time:

xxx (name of extension officer) was the driving force and made me listen. (Farmer interview, 4)

... the fact that the knowledge exchange managers (extension officers) are in contact with the farmers all the time, and with me all the time as well. It's a symbiotic relationship. (Vet interview JS, 6)

Some in the 'mid-project farmer survey' singled out AHDB extension officers as being very helpful. An AHDB extension officer said in the focus group:

For me, it's knowing the support you are going to get, that the KEMs [extension officers] are going to check in seeing how you are going on. That's what I found would keep them interested or keep them wanting to be a part of it. To keep the connection so that they could come to me and say, "Hey I've got a problem" and we have the knowledge we can offer them. You keep that connection going.

Other farmers described their AHDB extension officers as '*friendly and approachable*' (*farmer mid-project survey*) and '*very helpful*' (*farmer mid-project survey*).

On the issue of livestock housing, bringing in a specific expert on housing to the farmer-vet-extension officer meeting also helped to combine sources of support, which the veterinarians themselves appreciated:

So, the farms had the advice on the calf housing ... Two-fold expertise, you've got someone a little bit more expert than general vets, but it also sometimes feels that an outside opinion is valuable. I guess farmers do listen to us but sometimes if you've got an expert in the field, they've got a lot more experience, farmers often will listen a little bit more. (V1, JS)

The housing visit that they did was immensely helpful because it was getting in an outside person to just, to see the bigger picture, whereas us that are working on the farm more regularly, it's difficult to think outside the box almost. (V6, JS)

The last three quotes illustrate the importance not only of people in the delivery of behaviour change, but also connections between people, in this case farmers, vets, extension officers, and housing experts.

It was also noted by AHDB extension officers, farmers, and veterinarians that good project management was necessary to co-ordinate delivery between all actors on the project. A few responses in the 'farmer mid-project survey' criticised delays in receiving test results and this was reflected upon by one of the AHDB project managers, illustrating that 'back office' work was crucial in making sure interventions were delivered on time:

I've delivered a lot of projects in the past and this is the one I've had the most problems with in terms of third parties. I am always aware that procurement does take time and some of it did take more time than expected. (AHDB project manager, post-hoc written reflections)

The amount of work associated with third party co-ordination was further reflected upon by the same project manager:

The level of planning involved to ensure the incentive plans, team engagement, and stakeholder management ran smoothly was higher than first anticipated. We needed to ensure all areas worked in unison. We realised early on that we needed more staff to deliver the level of support required by farmers, management of some key partners. Not only the time but managing their involvement and keeping them to project guidelines. Vet clinics would try to push the boundaries regularly however, giving strong guidelines were very useful here to ensure a consistent offering and support. (AHDB Project Manager)

... [success] is more much more to do with the project management and what we realized is although we thought the third parties knew what they were doing and they were told specifically, dissemination of that information to their staff doesn't always go according to plan. (AHDB Project Manager)

Though the HerdAdvance project constructed a relatively simple AKIS, the many moving parts, multiple actors and interventions, meant that effective co-ordination was essential. This is a key lesson from the AKIS literature, as is finding the right trusted advisors (e.g. veterinarians) to convey advice to farmers (Bellet et al. 2015; Ellis-Iversen et al. 2010; Enticott 2023; Lahuerta-Marin et al. 2018; Speksnijder and Wagenaar 2018). In HerdAdvance, the most helpful interventions as defined by farmers – free vet advice, financial incentives, data collection – could not have been delivered in practice without the involvement and co-ordination of the AKIS, and the level of connectedness required to create '*symbiotic relationships*'. The valuable work of extension officers and project managers in liaising with third parties to deliver tests on

time, to contact veterinarians to remind them of farmer appointments, to broker on-farm conversations between farmers and veterinarians (offering support and challenge), and to maintain contact with and support participating farmers, should not be under-estimated.

3.3 Challenges and lessons for the future

In spite of the high farmer satisfaction rate, it is worth reflecting on some of the challenges experienced during HerdAdvance, as well as critically evaluating the lessons that may be taken for future projects. We note findings discussed in section 3.1 about the challenges of long-term farmer participation, due to external factors, time constraints, and the problem of showing short-term benefits. The mid-project farmer survey ($n = 169$) also asked if farmers had faced challenges in implementing agreed actions (Figure 4). Most selected 'no problems/barriers' (65%). Small numbers of farmers selected 'lack of knowledge' (12%), 'lack of perceived benefit' (11%), 'negative pre-conceived attitude to the action' (9%) and 'delays in receiving tests or other materials' (5%), which raise a link between the farmer dropout analysis in Section 3.1. Some of these challenges can be pre-cursors to lack of continued participation.

More interesting to note are the responses from 54 farmers who had finished the project and were asked in a subsequent survey about the challenges they had faced in carrying on with the type of proactive animal health planning practised in HerdAdvance. Figure 5 illustrates that the removal of economic incentives and free advice were identified by 81% and 65% of farmers as challenges.

Figure 1 clearly shows that veterinarian advice was valued by farmers. However, the change of veterinarian role to provide more proactive animal health planning advice was not without challenge. Quotes in Section 3.2 illustrated that veterinarians are rarely able to spend prolonged time discussing preventative health management options with farmers. In interviews, another veterinarian noted that their role in HerdAdvance was different than normal:

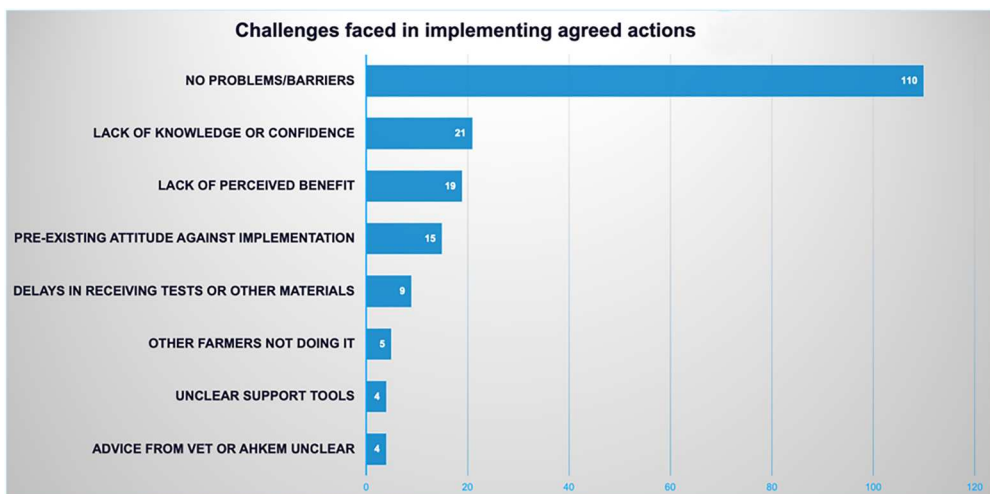


Figure 4. Challenges to implementing agreed practices during the project ($n = 169$, 3 farmers filled in postproject).

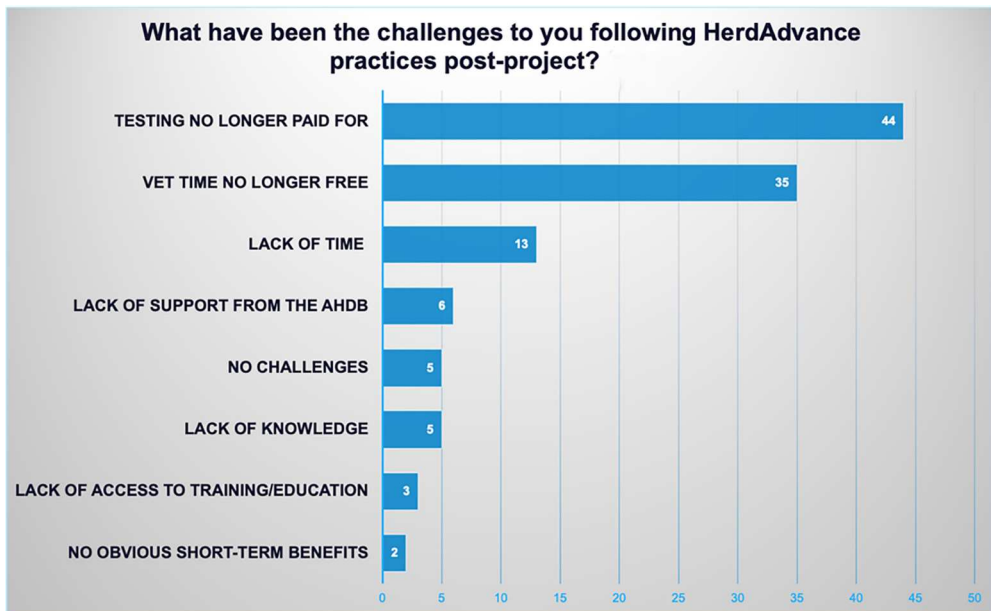


Figure 5. Challenges to continuing with HerdAdvance practices post-project ($n = 54$).

the project has done a great thing and pushed the practice into those places where we don't talk about often. (Vet 2, JB interview)

For such a wide-ranging project covering multiple diseases, as well as preventative advice, it is unsurprising that some veterinarians reported being '*more comfortable with certain topics*' (Vet 5, JB interview) than others. One farmer in interview also wondered whether their veterinarian '*understood enough*' about the project and questioned their ability to '*crossover*' into the role of preventative advisor (Farmer 3, JB interview). These views are consistent with findings from previous research, whereby veterinary surgeons most likely to be involved in delivering proactive herd health advice in key areas such as lameness or mastitis control are those veterinary surgeons that have benefitted from some form of post graduate education (Higgins et al. 2013). The literature also shows that veterinarians often feel like a 'fire-brigade' service, only arriving on-farm when animals were sick, leaving them in a crisis management position (Bellet et al. 2015). Bellet et al. (2015) described the use of proactive flock health plans developed by veterinarians with farmers during visits. Though the plans varied in quality depending on a range of factors, including which veterinarian developed them, Bellet et al. (2015) still found that flock health plans were still better than reactive management. In their study of antimicrobial usage, Speksnijder and Wagenaar (2018) also argued that some veterinarians could fall short in offering proactive management advice, partially because they themselves saw their role as providing a fast and cheap solution to existing animal health problems. Both studies also found that the perceived cost of regular proactive advice, for example in developing animal health management plans, was prohibitive. Our findings reinforce these studies, illustrating that advisors need training and support if asked to perform different types of extension roles.

4. Concluding remarks: research and policy recommendations

Behavioural change of farmers is a necessary component of sustainable agricultural transitions, which are being made across the world (de Boon, Sandström, and Rose 2024). From the design of post-Brexit agricultural policies in the UK, to Common Agricultural Policy reform in the European Union, and similar transitions for net zero and enhanced food security around the world, outcomes always involve land managers doing something differently. In this concluding section, we briefly reflect on our findings and make recommendations for researchers and/or policy-makers seeking to design and evaluate farmer behavioural change projects. Starting with farmer dropouts during a behavioural change project, it was noted in previous research that studies rarely explore the reasons behind it despite the phenomenon arguably contributing just as much to an evaluation than evidence from those who did not leave (Rose, Keating, and Morris 2018). Whilst it is not possible for project managers to do anything about succession or business issues, other reasons such as lack of perceived benefits, burdensome data collection, and time requirements can be addressed. Our findings illustrate the value of collecting dropout information for the design and delivery of current or future behavioural change projects, either helping to tweak the design of projects, finding a balance between data that needs to be collected and activities that are too burdensome, and shaping messaging to farmers about expectations and responsibilities. We note, however, that our findings lack depth in this area. Most of the farmers who dropped out could not be contacted and those reasons that were ascertained by AHDB project managers, collecting information on behalf of the research team, was limited because of time pressures and staffing issues. In design of future projects, robust plans to collect farmer dropout data need to be developed, which will involve a discussion of how to collect the data and by whom. Regular, but not overly frequent (due to time burdens), evaluations during a project can also identify pre-cursors to likely farmer dropout, allowing real-time improvements to be made.

Our findings also add empirical validation to the RESET model and AKIS literature, which stresses the value of a complementary set of different types of intervention and the importance of a connected advisory landscape. Our data also suggest that ensuring advisors have the right skills to adapt their approach, in this case veterinarians being able to offer more preventative advice rather than ‘fire-fighting’, is a key part of planning; education for advisors involved in the project, not just intervention recipients. They also show the value of developing and maintaining a connected AKIS for smooth project delivery, a task that should not be under-estimated in terms of financial or time requirements. The AHDB is a long-running and major levy board in the UK with one of its remits to do knowledge exchange with farmers. Referring to the high number of farmers and other actors involved in the project, experienced AHDB project managers said that ‘*the level of planning involved to ensure the incentive plans, team engagement, and stakeholder management, was higher than first anticipated*’. Thus, whilst good project management and responsiveness is not a novel recommendation, the case of HerdAdvance serves as an important reminder for delivery of similar projects by other extension organisations across the world.

Whilst the value of combined behavioural interventions and a connected AKIS are not new findings to the literature, our study offers the chance to reflect on how evaluation methodologies can grapple with the interconnectedness of interventions and people. In an analysis of 146 papers evaluating farmer behaviour change projects, Biesheuvel et al. (2021) found

that 51% of studies only collected quantitative data, with mixed methodologies used in only 20% of studies. In our study, quantitative data presented in [Figure 1](#) identified how valuable single interventions were. However, the effect of combining interventions, and most importantly, the people needed to implement them, was revealed in the qualitative data collection involving a range of different people participating in the project. If we had limited our methods to quantitative assessments, or to a narrow set of actors involved in the study, our take-home observations may have coalesced around the importance of free, accessible veterinarian advice, free testing, and the importance of data collection to monitor progress. Some of the critical actions for project success – reminder telephone calls from extension officers to farmers and veterinarians to honour meetings, chasing of organisations doing testing from project managers, post-veterinary advice support from extension officers – may be less commonly identified in overly simplistic quantitative surveys. In the planning of methods, evaluators are likely to face some of the same difficulties as our project team, who had to make sure not to overburden farmers and others involved in the large-scale project. However, our advice to researchers and policy-makers seeking to evaluate farmer behavioural change projects is to make sure that mixed methods approaches are used and that all people involved in delivery are included as far as possible.

Notes

1. The author team were not involved in the project when the AHDB took the decision to base interventions on the RESET model.
2. Further information can be found for HerdAdvance here <https://ahdb.org.uk/herdadvance>
3. Due to staff leaving the AHDB, complete figures for those completing final data collection visits (at end of Year 3) may not be accurate and thus are not reported.
4. This external evaluation is not yet publicly available but it should be released soon. However, this external evaluation indicated that significant progress was made during the course of the project in terms of improved animal health outcomes.
5. We do not have information on the total number of farmers who registered an interest, but did not start.
6. Three responses were given by farmers who had finished the project, but we decided that these answers were still valuable and they are retained in the analysis.
7. Marked as unclear in the spreadsheet. This mainly occurred when farmers answered that they just did not want to participate any more without wanting to expand on the reasoning.

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Supplemental information

Survey, focus group, and interview questions are available in a supplementary file.

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