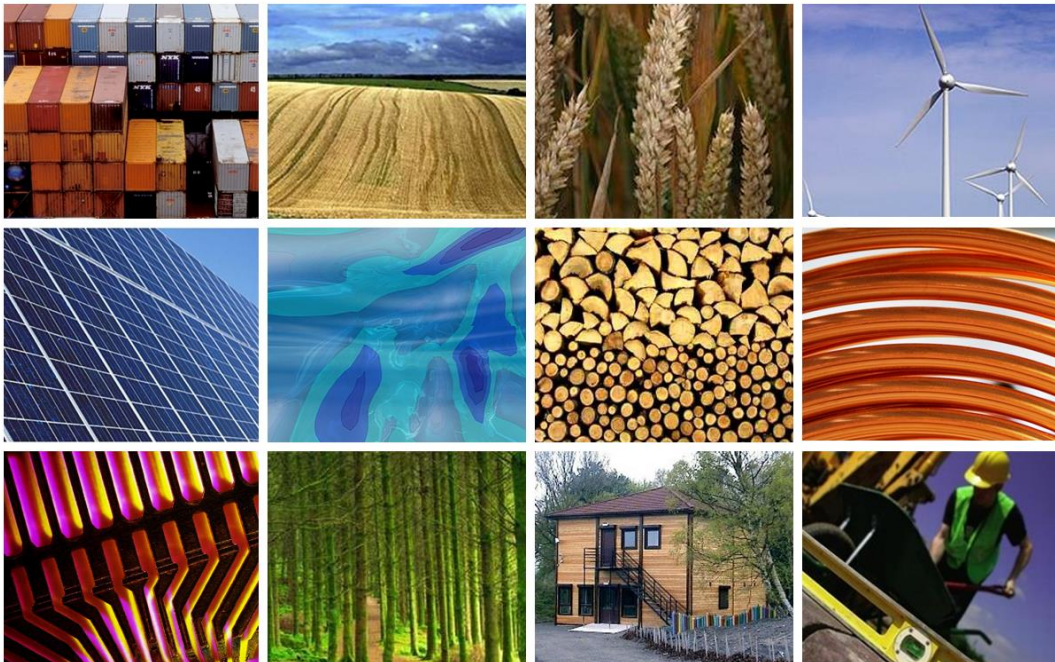


Nuffield Council on Bioethics, BBSRC and UKRI's Sciencewise

Genome Editing of Farmed Animals public dialogue

Final evaluation report

August 2022



Quality Management

URSUS Consulting Ltd has quality systems which have been assessed and approved to BS EN ISO9001:2000 (certificate number GB2002687).

Creation / Revision History

Issue / revision:	V2
Date:	15.09.2023
Prepared by:	Anna MacGillivray
Authorised by:	Hilary Livesey
Project number:	U.189
File reference:	GEFA final evaluation report

URSUS CONSULTING LTD
www.ursusconsulting.co.uk

57 Balfour Road
London N5 2HD
United Kingdom
Tel. 07989 554504



Contents

Glossary and Acronyms

EXECUTIVE SUMMARY

1	INTRODUCTION.....	1
1.1	Introduction.....	1
1.2	Background context.....	1
1.3	Objectives of the dialogue	2
1.4	Dialogue framing and expected challenges	3
1.5	The dialogue approach.....	4
2	IMPACT ON POLICY AND RESEARCH.....	5
2.1	Dissemination of dialogue outputs and messages.....	5
2.2	Potential impact on GEFA related policy.....	7
2.3	Potential research impact	11
2.4	Potential to encourage further use of public dialogue	13
2.5	Potential for benefits to outweigh dialogue costs	15
3	SUCCESS FACTORS IN MEETING THE DIALOGUE OBJECTIVES	17
3.1	Objectives have largely been met.....	17
3.2	Key factors which have contributed to meeting the objectives.....	18
3.2.1	An Oversight Group that reflected all key perspectives.....	18
3.2.2	An experienced core management team willing to work to tight deadlines.....	18
3.2.3	An online format enabled recruitment of a very diverse group of participants	19
3.2.4	A broad framing and iterative design approach.....	19
3.2.5	Innovation and Good Practice in delivery.....	20
4	CONCLUSIONS, LESSONS AND RECOMMENDATIONS	24
4.1	Conclusions	24
4.2	Lessons learnt.....	24
4.3	Recommendations.....	25
4.3.1	For commissioners.....	25
4.3.2	For contractors.....	26

Annex A - Oversight Group members

Annex B: Specialist Contributors

A separate Annex document covers:

A detailed dialogue methodology

Assessment of how far design and delivery met best practice

Participant evaluation feedback

Glossary and Acronyms

ACNFP	FSA 's Advisory Committee on Novel Foods and Processes (ACNFP)
BBSCR	Biotechnology and Biological Sciences Research Council
BEIS	Department of Business Energy and Industrial Strategy
CRISPR-Cas9	Clustered Regularly Interspaced Short Palindromic Repeat - a gene editing technique to alter DNA (genetic) sequence, which can be used anywhere in the genome to turn genes on or off
DEFRA	Department of Environment, Farming and Rural Areas
EFFAB	European Animal Breeders Association
FSA	Food Standards Agency
GE	Genome editing methods used to modify existing genetic material
GEFA	Genome editing of farmed animals
GMO	Genetically Modified Organisms (typically involved material from other species)
IEMA	Institute of Environmental Management and Assessment
NCoB	Nuffield Council on Bioethics
NFU	National Farmers Union
NGO	Non-Governmental Organisation
NGT	New Genomic Techniques
PRRS	Porcine reproductive and respiratory syndrome
PB	Precision breeding - as used in the Genetic Technology (Precision Breeding) Bill to define plants or animals whose genomes have been altered using biotechnologies in ways that could potentially have been achieved using conventional breeding techniques
PB	Precision Bred organisms
RSPCA	Royal Society for the Protection of Cruelty to Animals
SOIF	School of International Futures

Executive summary of independent evaluation of a public dialogue on Genome Editing of Farmed Animals (GEFA)

The dialogue and this evaluation were commissioned by two organisations - BBSRC and the Nuffield Council on Bioethics (NCoB) – and co-funded and supported by the UKRI Sciencewise programme. The dialogue was designed and delivered by Basis Social Research in collaboration with the School of International Futures (SOIF).

Context

Genome editing - known commonly as 'gene editing' - is the precise, targeted alteration of a DNA sequence in a living cell. It enables changes to the genome - which aim to secure certain traits in new generations of farmed animals - to be made much faster than through conventional breeding methods. In the UK research (some of it funded by BBSRC) is already underway and the UK Parliament has approved the Genetic Technologies (Precision Breeding - PB) Act 2023, as framework legislation changing the way that genome edited organisms, including plants and animals, could be introduced into the food and farming system.

Dialogue aims and approach

- The overall aim of the dialogue was to increase understanding of how citizens prioritise different values and considerations with respect to GEFA, to interrogate assumptions which may influence opinions, and to identify potential points of consensus and disagreement among members of the public.
- The dialogue was framed within the context of the wider food system and future challenges that it faces. In order to have maximum policy impact, the work was commissioned to deliver findings in September 2022 in time to inform the third reading of the PB Bill in the House of Commons before it progressed to the House of Lords.
- The process brought together about 80 members of the public, 70 of whom attended all four online workshops (Zoom) on Saturday mornings during May and July 2022. The participants were recruited from across the country to be broadly reflective of UK demographics and, proportionately, of a range of dietary habits (from meat eaters to vegans), religious and views on the use of animals in science.

Key elements which made this a successful dialogue

- **A large and well chaired Oversight Group** (OG) led by Sarah Mukherjee MBE which represented all key perspectives and helped agree the broad farming system framing before focusing in on potential GEFA applications which researchers hope will have benefits from animal welfare to human health, environmental and climate purposes.
- **An experienced core management team including the commissioners, Sciencewise and the contractors was willing to work to tight deadlines to help keep the dialogue on task.** The commissioners were flexible in slipping the final deadline to ensure a high quality and robust report with findings capable of influencing policy makers.
- **An iterative design approach** combined a skeleton design which would deliver the dialogue objectives with some flexibility to follow participants' interests (such as hearing different perspectives or having space to talk about non-GEFA solutions) in the detailed design of fortnightly sessions.

- **An online format which allowed diverse and inclusive group of participants to be recruited despite Covid restrictions still in place.** Contingencies to address potential dropouts included over-recruitment and catch up sessions with a handful of participants who missed workshop 1.
- **Innovative design elements made the most of the online format.** A dedicated share site (Engagement HQ) worked well for participants as a repository of information and for individual deliberation. An AI bot survey tool (INCA) brought in many additional voices of friends and family. Dedicated share sites (Teams) for the core team and OG worked well to share materials, coordinate inputs and track comments on the report.
- **A varied mix of materials (including vox pops, animated videos, contributions from 16 specialists, and homework exercises on the Engagement HQ)** provided enough, stimulating background information for participants to engage confidently.
- **Some excellent facilitation in small groups (4-6 participants) created an atmosphere and space for all participants to feel comfortable and share their views.** Some mixing of the small groups for later sessions might have been helpful in exposing them to the full range of lived experiences and points of view across the wider group.

Dialogue impacts

- The dialogue findings were presented in published report and at an online launch event on 12th October 2022. The event was attended by some 75 policy makers, stakeholders, OG members and participants. Before and since the launch, the commissioners worked closely with MPs, Peers, the Defra animal regulations drafting team and GEFA researchers to consider the outcomes of the dialogue.
- Although it is difficult to demonstrate direct impacts on the wording of the PB Bill, there is plenty of evidence that the findings have influenced the discussions in both houses of parliament and amongst policy makers. The dialogue was directly cited in the Commons (by MP Daniel Zeichner who attended the launch), in the Lords (by Baroness Bennett) and in a parliamentary briefing note.
- Many of the key concerns raised by dialogue participants (the preference for animal welfare, using GEFA for public rather than private benefit, the need for strong regulation and risk assessment based on sustainability not just human health, and support for labelling of PB produces) were echoed in proposed amendments and in discussions in parliament. While no amendments ultimately made it into the main bill, there is still scope for the findings to inform detailed regulations being developed by FSA (on PB product risk assessment, a central register, traceability and labelling) and by Defra (on detailed regulations for GEFA). Defra has already updated its factsheet on what this may cover in the light of the dialogue findings.
- The findings are also expected to inform BBSRC's research priorities on GEFA and those of strategically funded research stations (Roslin, Pirbright and Rothamsted). Indirectly this will also influence commercial breeders who are working with these institutes.
- Lessons from the process are also expected to feed into BBSRC's overall public engagement strategy and the interest amongst organisations represented on the oversight group to consider public dialogue as a methodology in future.

Lessons learnt and recommendations

For commissioners

- If a dialogue is expected to inform a particular policy process then allow plenty of time so that findings can be delivered to a realistic timescale. In this case delays in procurement created some time pressures during the design stage and in final reporting.
- Reduce risks of delays by setting a date for the first OG meeting – ideally face-to-face – with plenty of time to explore role, expectations, timetables and surface hot issues - as early as possible.
- Allow enough time for the contractor and core team to work together on the structure, level of analysis, style and tone of the final report after the first cut of the analysis.

For contractors on design and delivery

- Ensure that the overall design will address all dialogue objectives (e.g. in this case factoring in exercises/surveys/sessions/visible notetaking by facilitators to uncover areas of consensus and disagreement).
- When timescales are tight, as they were with this dialogue, provide OG members and the core team with a detailed timetable for making their contributions to the design.
- If there is not time for a public pilot, consider 'piloting' with facilitators in order to test discussion guides (flow, timings, language).
- Consider scheduling online workshops as a mix of shorter and longer sessions, including both weekday evenings and Saturday mornings, to encourage high attendance rates.
- For dialogues on contentious or highly politicised topics consider including an early session on data sources, how to interpret them, and highlighting hot topic areas where specialists may disagree.
- Captioned videos can be much more engaging than conventional PowerPoint for sharing information with participants. In this case participant and OG generated content and contextual images/footage managed to convey a lot of information in a way that participants found accessible. Consider adding value by making such materials available to commissioners for subsequent public engagement. This may involve ensuring that distribution rights for images/footage are secured in advance. Consider allowing some budget for independent filming (e.g. in research settings) and with participants and commissioners to bring the dialogue to life for wider audiences.
- Consider developing a dedicated participant microsite for sharing instructions, materials and opportunities for individual reflections. Remember to factor in time (for design, moderation and analysis) and perhaps financial incentives for participants to take part, although in this case participants were interested enough to welcome the opportunity.
- In order to fully benefit from specialist contributions start with a long list of knowledge gaps/ perspectives to be covered and fill as many as possible before field work starts. Ensure that both specialists and facilitators are well briefed on how they can contribute, and that all participants have a chance to hear any key information and answers to questions (e.g. via vox pop interviews, panel discussions, Q+A sessions or written responses).
- If using innovative tools or exercises (such as AI bots or visioning workshops) ensure that the outcomes can be fully integrated so they can add value to the design or analysis.

1 Introduction

1.1 Introduction

This report has been prepared by URSUS Consulting and presents the findings of the evaluation of a public dialogue on genome editing of farmed animals (GEFA). The dialogue and evaluation were co-commissioned by Nuffield Council on Bioethics (NCoB) and the Biotechnology and Biological Sciences Research Council (BBSRC), part of UK Research and Innovation (UKRI). Both the dialogue and evaluation were co-funded and supported by UKRI's Sciencewise programme.¹ The dialogue was delivered by Basis Social Research in collaboration with the School of International Futures (SOIF).

This report focuses on the dialogue impacts (*Section 2*), those elements which have contributed to meeting the dialogue objectives (*Section 3*), and draws conclusions, lessons and recommendations for future dialogues (*Section 4*). The report draws on evaluation evidence gathered from observing meetings and public workshops, surveys with participants, and some 25 semi-structured interviews with the core team, Oversight Group members and policy makers.

1.2 Background context

- Genome editing (GE) uses new molecular biology techniques to make the alteration of an organism's genome more precise, efficient and less expensive than conventional selective breeding and older genetic technologies such as genetic modification (GM). GE in farmed animals (GEFA) can influence the development of physical traits: researchers believe this can help improve farmed animal health and welfare, productivity and resilience to and impact on climate change, and applications that would contribute to human health and nutrition.
- Products involving GE are currently regulated under the retained EU framework of law on genetically modified organisms (GMOs).² The European Commission has conducted its own [public consultation](#)³ (April-July 2022) on the suitability of its approach for new genomic techniques (NGTs), but this did not extend to farmed animals.
- Since 2016 the UK Government has signalled its intention to review and amend legislation on both plant and animal organisms which use 'precision technologies'⁴ in order to reflect technological advances and help position the UK as a world leader in this

¹ The Sciencewise programme enables policy makers to develop socially informed policy, with a particular emphasis on science and technology.

² Regulations developed between 2001-9 to protect human and animal health and the environment and ensure common approaches to risk, traceability and labelling.

<https://curia.europa.eu/jcms/upload/docs/application/pdf/2018-07/cp180111en.pdf>

³ Legislation for plants produced by certain new genomic techniques Public Consultation Factual Summary Report, European Commission, September 2022

<file:///C:/Users/annam/Dropbox/PC/Downloads/090166e5f15a575d.pdf>

⁴ Defined as involving the use of GE techniques to achieve outcomes that could have been achieved using traditional breeding techniques, albeit more slowly, but not including GMOs

area. The [Genetic Technologies \(known as the Precision Breeding\) Bill](#) (the PB Bill)⁵ is intended to allow precision bred (PB) products to be authorised and brought to market more easily. The Bill passed into law in March 2023 and takes the form of enabling legislation⁶ with detailed supporting regulations to be drafted by Defra and the Foods Standards Agency (FSA) in late 2023 and 2024.

- BBSRC has an interest in GEFA, as one of the major funders of existing research in this area, and NCoB has had an interest in GE as one of its core research themes (see *Box 1.1*) including carrying out a mini dialogue with 40 participants. Conversations were ongoing with BBSRC and UKRI Sciencewise throughout the development and delivery of that work: all three organisations agreed that this smaller piece of work would provide a useful platform for a larger co-funded dialogue.
- NCoB and BBSRC both have strong relationships with Defra and FSA and invited them to participate in this larger dialogue: both organisations expressed an interest in being involved and hearing the findings, but had already commissioned their own public engagement - Defra via an online consultation and FSA via public opinion polls and a small citizens forum⁷ - however, both nominated officers to sit on the Oversight Group (OG).
- Largely as a result of sharing the findings of the 2019 NCoB report⁸ and engagement with the Defra Minister, Jo Churchill, and her team (Feb 2022) Defra committed to include GEFA in the legislation, but to bring forward detailed regulations before authorising GEFA products for marketing.
- Discussions between Defra, NCoB and BBSRC contributed to setting an aspirational and challenging deadline, of publishing the dialogue report in early September 2022 so that findings could help inform the passage of the PB bill through parliament.

1.3 Objectives of the dialogue

The overall aim of this dialogue was to increase understanding of how citizens prioritise different values and considerations with respect to GEFA, to interrogate assumptions which may influence opinions, and to identify potential points of consensus and disagreement among members of the public and what informs these views.

The specific objectives were:

- To identify and understand the values citizens use to frame their views on genome editing in farmed animals, to provide context for understanding wider public interest on this topic.

⁵ Announced during the Queen's Speech in May 2022, before the first workshop

⁶ Defra will first seek to change the rules relating to gene editing to cut red tape for crop trials with a focus on plants produced by genetic technologies, where genetic changes could have happened through traditional breeding methods. GMO regulations will continue to apply where gene editing introduces DNA from other species into an organism.

⁷ Work by the Defra [public consultation on genetic technologies in food](#), and by Food Standards Agency <https://www.food.gov.uk/research/behaviour-and-perception/consumer-perceptions-of-genome-edited-food> (2021)

⁸ NCoB, 2021 [Genome editing and farmed animal breeding: social and ethical issues'](#)

- To map the values and principles that underlie dialogue participants' views on genome editing in farmed animals, offering insights into how views are formed.
- To explore, interrogate, and understand conditions of consensus and disagreement among citizens.
- To identify areas of public aspiration, interest, and concern, including with respect to animal welfare and the marketing of animal products.
- To inform future research strategies, regulation, and policy on genome editing in farmed animals.

The PB Bill is one aspect of the broader policy picture, which connects research and innovation, diffusion and normalisation of system-shaping technologies. The dialogue findings were also expected to inform BBSRC's research strategies being developed during 2022-2023. The extent that these policy impacts have been achieved is explored in *Chapter 2*.

1.4 Dialogue framing and expected challenges

The dialogue framing drew on findings from the NCoB's mini dialogue, which found that the public's views depend on what role they are asked to take: as consumers they focus on safety and freedom of choice; as citizens they are more concerned with wider societal and ethical issues such as animal welfare and justice.

Box 1.1: How the dialogue was framed

- NCoB's early research on GE highlighted⁹ the many organisations looking at plants and human health but exposed a gap in research on GEFA (including aquaculture), despite a number of applications being funded via BBSRC being close to market⁹.
- This spurred a two year inquiry (2019-21) into GEFA based on a detailed literature review of what survey data showed about public attitudes to GEFA (from older GM techniques to CRISPR-Cas9).¹⁰ The report highlighted the complex challenges around GEFA in terms of animal health and welfare, human health, societal and cultural attitudes and potential impacts on the environment and ecosystems.
- A sub task included a rapid mini dialogue with 40 participants, delivered by Basis Social Research in Summer 2021. This sought to fill identified gaps in the qualitative research and act as a counterpoint to [research carried out by the FSA](#)¹¹ which focused mainly on plants, the public's attitudes as 'consumers' and highlighted risks to human health and consumer choice. NCoB's dialogue explored whether people might have different concerns if asked to think as 'citizens.'
- NCoB responded to Defra's consultations in January 2021 and regularly shared emerging findings ahead of publication of its report, in December 2021.

As with all Sciencewise dialogues, the emphasis here was on thinking as citizens. In order to enable this perspective, both commissioners agreed that a broad framing within the food and farming system would be needed, so that participants would be able to think about GEFA as one solution among others to the future challenges¹² - health, food security, justice

⁹ Such as work by [Roslin with Genus on resistance to porcine reproductive and respiratory syndrome \(PRRS\)](#).

¹⁰ Clustered Regularly Interspaced Short Palindromic Repeat - a gene editing technique to alter DNA (genetic sequence, which can be used anywhere in the genome to turn genes on or off).

¹¹ FSA and Ipsos Mori, Consumer perceptions of genome edited food, July 2021

<https://www.food.gov.uk/sites/default/files/media/document/consumer-perceptions-of-genome-edited-food.pdf>

¹² As raised by Henry Dimbleby's 2021 National Food Strategy <https://www.nationalfoodstrategy.org>

and welfare, environment and climate change – facing the system. Future global challenges were also identified through a ‘future foresights’ exercise led by SOIF.

Building on Sciencewise learning from previous [public dialogues around the food system](#)¹³, it was agreed that the design would need to strike a balance between considering GEFA applications in sufficient depth to meet the needs of the commissioners and leaving space for the design to be developed in the light of where participants wanted to take the conversation.

The complexity and contentious nature of the topic also raised some specific challenges:

- Giving participants a broad enough grounding in GEFA (how animals are currently bred and raised, how GEFA could be applied for different purposes, and how it is currently/ could be regulated from the laboratory to the plate) without overwhelming them.
- Allowing participants space to work through their initial surprise on learning how animals are currently treated in the food system.
- Exposing participants to a full range of perspectives on hot topics and in contested areas.

1.5 The dialogue approach

- This was a medium-sized dialogue which ran from March to October 2022. A mix of 80 participants were involved: 70 attended all five online (Zoom) workshops.
- The project was managed by a core team (representing the co-commissioners, Sciencewise, the Basis project director/lead designer and project manager, and evaluator) and overseen by a large OG (see *Annex A*) who brought a wide range of perspectives from the fields of agricultural policy, genetic engineering, animal welfare and ethics. Further perspectives were brought by a large pool of specialist contributors (see *Annex B*).
- Despite a slippage in commissioning the field was completed before the summer and the final report was published and launched at an online webinar hosted by NCoB on 12th October. The full report, executive summary and supporting materials are available at [Nuffield](#), [Sciencewise](#) and [UKRI](#) websites. A fuller description of the methodology and findings is available in a separate annex.

¹³ Sciencewise, Defra and Hopkins van Mills, Public dialogue on the National food strategy <https://live-sciencewise.pantheonsite.io/2020/04/national-food-strategy-public-dialogue-launched/>

2 Impact on policy and research

This chapter explores the dialogue's impact on future research strategies, regulation, and policy on genome editing in farmed animals. The following sections describe:

- *Section 2.1* how the report and key findings have been communicated and disseminated.
- *Section 2.2* how the findings have helped inform UK Government policy through the Precision Breeding Bill and Defra and the Food Standards Agency (FSA) work on secondary regulations.¹⁴
- *Section 2.3* potential impacts on GEFA-related research priorities through BBSRC, its strategically funded research institutes, and collaborating commercial breeders.
- *Section 2.4* how knowledge or capacity gained through this dialogue may impact on relevant organisations - including policy makers (Defra and FSA), commissioners (NCoB and BBSRC) and others - to undertake future engagement with the public on these issues.
- *Section 2.5* compares the economic costs and potential benefits of the dialogue.

2.1 Dissemination of dialogue outputs and messages

Reporting the dialogue findings

- The core team worked very closely with the contractors on the drafting, review and sign-off of the final report. A combination of factors (the need for more time to analyse the volume of data produced in the online process, a national period of mourning and rail strikes) contributed to a one month delay in publication and launch.
- NCoB's non-governmental status proved a real bonus in shortening the approval process for publication and launch, removing uncertainties about trying to secure ministerial sign-off in the context of major departmental reshuffles during Autumn 2022. Despite this, producing the quality of report expected by the commissioners still required a lot of hard work from the core team, including asking senior staff in both commissioning bodies to review drafts at the last minute.
- The final report was produced to very high design standards, met both commissioners' needs and fully reflected the quality of the process. The forewords signed by both directors added weight and gravitas to the findings and has helped key audiences to consider the process robust and findings credible.
- OG members providing feedback via evaluation interviews or survey (13 of the 19) also found the final report well-structured with messages that resonated and that they variously described as "*thoughtful*", "*considered*" and "*nuanced*." Interviewees felt the report was timely with considerable potential for impact: "*The report provides a significant data set of the viewpoints of a cross section of British society. As such, it provides a solid starting point for the discussions around these policies.*"

¹⁴ FSA is designing a new science-based pre-market authorisation process for food and feed products developed involving precision-bred organisms. The proposed two tier approach is focused on human health risks but also allows for wider risks based on five key principles: safety, transparency, proportionality, traceability and building consumer confidence.

Disseminating the findings

- An in-person launch event – initially planned for mid-September – slipped to October, but since the PB bill also slipped for similar reasons this has not proved a problem. The rescheduled online event was less high profile than a face-to-face event might have been, but the convenience of holding it online attracted an impressive audience (74 attendees including senior officers in both commissioning bodies, an MP, and many practitioners including members of the OG).¹⁵
- Three public participants (two men and one woman) took part as ‘panellists’ contributing to the success of the event. All were well-briefed, relaxed and articulate: and their lively contributions and clear passion for the topic helped reinforced key policy messages. These were duly noted by the MP Daniel Zeichner in his closing remarks, who went on to share them in the House of Commons during readings of the PB Bill (*see Box 2.1*).
- About a dozen stakeholders asked detailed questions about the findings and their implications for future legislation. Had time allowed, these would have been answered by the panel within the webinar. Instead, the commissioners undertook to share answers after the event and this took the form of an NCoB blogpost.
- As a result of the comms strategy (press release, tweets and blogs and the NCoB director available for interview) the report attracted considerable press attention (*see Box 2.1*).
- All OG members interviewed said they had shared the report and key messages with internal colleagues. Several have also shared findings more widely via blogs, articles, press interviews or through advocacy meetings around the PB Bill parliamentary process (*See Table 2.1*).
- Most OG members picked up on messages that the public are interested in the complexities of the food and farming system, want to see animals having a ‘good life’ (over and beyond the Defra five animal welfare ‘freedoms’), see some place for GEFA applications within a robust governance and regulatory framework, but with a strong preference for applications that deliver public benefit and animal welfare rather than private profits. A few found the message that - despite stated concerns about food poverty and climate change - most participants were less interested in GEFA applications that simply increased animal productivity, surprising.

Box 2.1: Press coverage and citations since the launch

- Social media coverage via tweets by NCoB and BBSRC, and blogs by OG members.
- [BBC Radio 4 Farming Today](#) (Oct) included an interview with the NCoB Director with later programmes in early November continuing to talk about GEFA around the progress of Precision Breeding bill.
- [Farming UK](#) and [Farmers Weekly](#) included articles with the latter including quotes from an interview with OG member, Pat Thomas.
- Mentions on specialist sites (Zenopa, the science recruitment site) and [Newcastle University](#).

Table 2.1: Dissemination of dialogue findings by OG members and others

¹⁵ 74 out of 100 who signed up, including representatives from universities (in the UK and Europe), Royal Societies, NGOs, government departments, the business sector, commissioning bodies and a Member of Parliament.

Organisation	Dissemination of report and findings
NCoB	<ul style="list-style-type: none"> • Blog 'Farming Tomorrow: the Genetic Technology (Precision Breeding) Act 2023 4.4.2023, Pete Mills • Blog "Our top Five", Dec 2022, Danielle Hamm
British Nutrition Foundation (BNF)	<ul style="list-style-type: none"> • Website page on genome editing and the public dialogue • Report link also shared via: Food industry supporters such as AHDB (50 organisations) • BNF newsletter; BNF education programme talks and materials for primary and secondary schools • Has generated interest and enquiries prompting short pieces on GE • BNF has also commissioned a mini dialogue with Basis in a food related area
RSPCA	<ul style="list-style-type: none"> • Findings on public support for strong legislation, priorities uses for animal welfare and public benefit, and support for alternative (non-GEFA) solutions to food system challenges. • Blog on LinkedIn • Findings shared with colleagues • Informed RSPCA position on application of biotech to animals • Findings on wider stakeholders (scientists, vets and animal welfare groups) • Findings presented at British Veterinary Association debate • Informed RSPCA submission to PB Bill and policy discussions on animal welfare with the Defra drafting team • Internal audiences and on messages about
Soil Association	<ul style="list-style-type: none"> • Article on Website stressing the need for a rethink of the PB Bill
Royal Society (RS)	<ul style="list-style-type: none"> • Retweeted press release. • Findings on the hierarchy of GEFA applications unsurprising. Messages that the public should be engaged in regulatory decisions resonates with recent RS dialogues and relevant to future work on GE in animals and plants.
Food retailer (Asda)	<ul style="list-style-type: none"> • Shared messages about public attitudes to GEFA products (including interest in labelling) with Agricultural managers for horizon scanning, but do not expect to have to act on them for at least 5 years.
Beyond GM	<ul style="list-style-type: none"> • Press interview after the launch (Farmers Weekly, 12.10.2022), praised the robustness of the process. "There is an integrity and an intelligence to these findings that our regulators would do well to take on board," • Advocacy with other organisations calling for labelling of all PB products.
London School Hygiene & Tropical Medicine	<ul style="list-style-type: none"> • Findings shared with colleagues • And through Blog

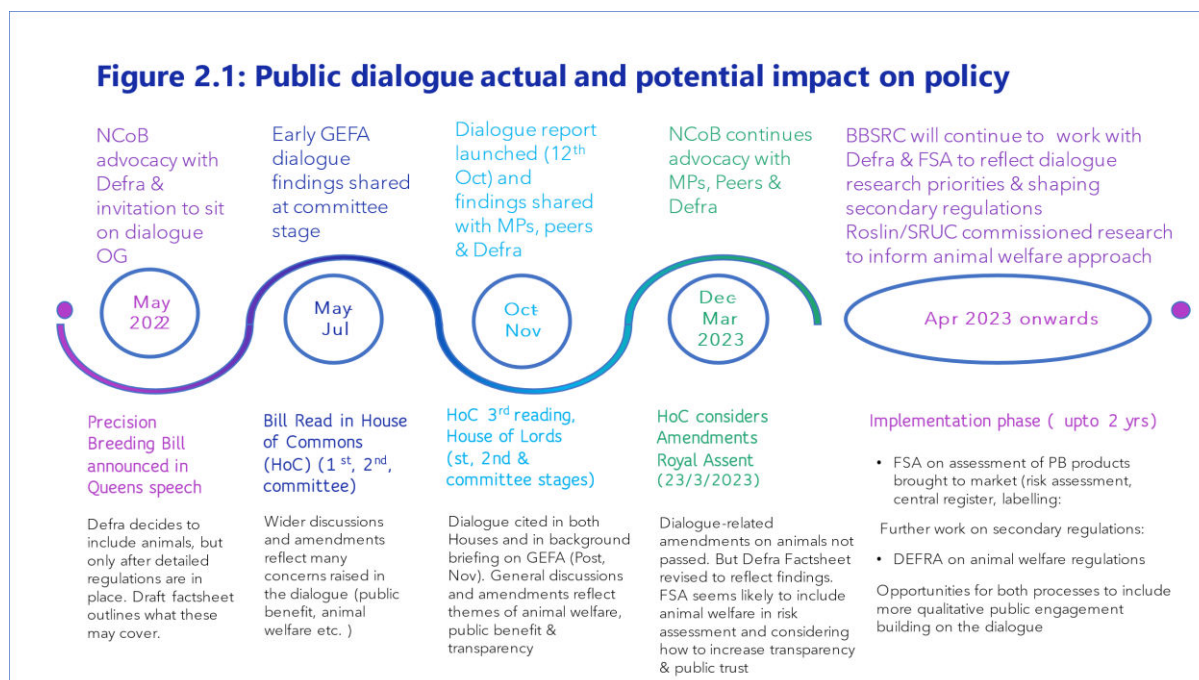
2.2 Potential impact on GEFA related policy

"With the Genetic Technology (Precision Breeding) Bill currently going through Parliament, this is a crucial moment for policy makers to listen to the important public perspectives that have emerged during this dialogue...It has demonstrated [the public's] appetite for dialogue and ability to get to grips with this subject matter. We trust that policy makers will engage with this dialogue to help shape regulatory pathways and direct the development of genome editing in agriculture towards ethically acceptable outcomes." | Danielle Hamm, Director, Nuffield Council on Bioethics, foreword to dialogue report

As shown in *Figure 2.1* the dialogue has helped inform the framing of and discourse around the PB Bill as it has progressed through parliament. While it is not possible to point to actual changes in the wording or amendments to the main legislation as a direct result of the dialogue, *Box 2.2* summarises ways in which interviewees agree the dialogue has been

"influential of the 'mood music'" and "helped to clarify public understanding and views; and the extent of social licence to gene edit animals in different contexts."

One interviewee suggested that in a few areas – such as the distinction between modern breeding techniques and GE outside of the lab - findings could have *"generated confusion around issues [such as labelling and traceability] not related directly to new breeding technologies."* Desk research and evaluation interviews suggest that the findings have greater scope to directly influence secondary regulations now being drafted, as discussed below.



Informing primary legislation

- Agreement that GEFA will only go forward once detailed regulations are in place had already been agreed by Defra: this position was laid out in a Defra [factsheet](#) accompanying the PB Bill. Since then NCoB has shared dialogue findings with Defra via various routes including: their representative on the OG; emerging evidence submitted at the bill committee stage (July 2022 while fieldwork was still ongoing); and through regular meetings with the Defra team drafting animal regulations.¹⁶
- Once the report was published key messages were picked up in a [background brief](#)¹⁷, (Nov 2023) published by the Parliamentary Office of Science and Technology (POST). This cited the report and highlighted concerns which were also fed in via OG members.
- The dialogue and its findings were directly and indirectly cited during readings in both the Houses (in the Commons by MP Daniel Zeichner and in the Lords by peer Baroness Bennett). Amendments reflecting concerns voiced by participants were tabled and discussed throughout readings in both houses.

¹⁶ <https://publications.parliament.uk/pa/bills/cbill/58-03/0011/PBBillFactSheetAnimals.pdf>

¹⁷ <https://researchbriefings.files.parliament.uk/documents/POST-PB-0050/POST-PB-0050.pdf>

Box 2.2: How the dialogue has helped inform the Precision Breeding (PB) Bill process

Daniel Zeichner, MP attends the Launch.

- As a key proponent for GEFA-related amendments in the House of Commons he offered the formal closing remarks sharing his hopes that the PB Bill would be discussed in the wider context of the food and farming system, as the dialogue had been.

Dialogue report cited in the parliamentary briefing report (POST Nov 2022).

- References included in the overview and on p34 to help inform policymakers about GEFA aspects. Dialogue messages that the *"public sees the current livestock farming system as out of balance, is concerned about GEFA being used to intensify production (even where it also improves animal welfare through improved disease resistance), and would like to see it used only where there is a material benefit for the animal highlighted. Also public interest in labelling GEFA animal products to enable food choices."*
- The report called on policymakers to set out a clear vision for the sector (rather than just introducing genome-edited animals into the existing system). Two members of OG (NFU and Commercial breeder) were interviewed for the report while other organisations represented on the OG are also cited.

The Defra team discusses dialogue issues with stakeholders, officials, and amends animal factsheet.

- The Defra team found dialogue findings resonated with opinions they had heard through correspondence with NGOs and in the media: *"Although they did not appear surprising to us, it was helpful to gain a broader understanding of the concerns of the public on this issue and on animal breeding more widely."*
- During Nov 2022, Defra held several stakeholder workshops where issues raised in the dialogue were discussed. The dialogue report also helped officials in understanding the background to some amendments proposed during the passage of the Bill through Parliament. Defra updated its factsheet on how GEFA governance¹⁸ might work.

The Dialogue is cited in the House of Commons

- During the **third reading (31.11.2022)** Daniel Zeichner talked about the dialogue¹⁹, praised its broad food systems framing, and highlighted the public participants' concerns: *"...They, like us, want animal welfare concerns addressed. They want transparency and a stronger framework, and they want to be sure that the technology is used for the wider good, not just to maximise returns."* These concerns and those around public benefit uses and the need for strong and transparent risk assessment, traceability, labelling continued to be discussed in later readings.

And then referred to directly and indirectly in the House of Lords

- During the second reading in the House of Lords (21.11.2022) [transcripts](#) show Baronesses Parminter, Hayman, and Lady Jones of Whitchurch referred directly to Nuffield's work (and to the dialogue explicitly). Together with a mix of crossbench, Labour, Conservatives, Liberal Democrats and Green Party peers, they raised GEFA related concerns that echoed benefits and concerns identified by public dialogue participants.
- Again in mid-December further references were made to the need for and value of public debate: and although the public dialogue was not cited directly it is fairly clear - not least because NCoB had discussed it with the speakers in question - that they had the public dialogue in mind.
- On the [reading on 14.12.2022](#) the public dialogue findings were directly cited in discussions about labelling amendments: *"I also note that the Nuffield Council on Bioethics, BBSRC and Sciencewise's Public Dialogue on Genome Editing in Farmed Animals found that consumer "wanted products from genome edited animals to be labelled as such."* | Baroness Bennett column 736

¹⁸ Genetic Technology (Precision Breeding) Bill, Precision Breeding and Animal Welfare – Future Framework

¹⁹ Genetic Technology (Precision Breeding) Bill Volume 721: debated on Monday 31 October 2022

[https://hansard.parliament.uk/commons/2022-10-31/debates/0FFD4BB6-68DF-46C1-9BC5-6DC7779C29CB/GeneticTechnology\(PrecisionBreeding\)Bill#](https://hansard.parliament.uk/commons/2022-10-31/debates/0FFD4BB6-68DF-46C1-9BC5-6DC7779C29CB/GeneticTechnology(PrecisionBreeding)Bill#)

"Let me particularly cite the work from the Nuffield Council on Bioethics. Unlike this Bill, which takes the narrowest approach possible, it stood back and asked the bigger questions about our food system, about our treatment of animals, about where traditional selective breeding has brought us to, and about how we might approach novel foods and the great changes that we may see in a very few years. In its recent public dialogue, the results of which were published just a few weeks ago, it demonstrated that the public are quite capable of taking a sensible and considered view, one that sits well with the amendments we tabled in Committee, some of which we raise again today. Those who took part in that detailed discussion would not be satisfied with the Bill as it stands, and I hope the Government have taken note....." Daniel Zeichner

- Ultimately, none of the GEFA-related amendments made it into the final legislation. Neither were policy makers willing to set the bill in a wider food systems context and develop a more strategic, joined up approach to regulation and governance from research, through farming to marketing of GEFA products, as dialogue participants had suggested. Nevertheless, the Defra team have appreciated the work of the co-commissioners so far:

"We are grateful for the work of the Nuffield Council on Bioethics and Biotechnology and Biological Sciences Research Council, as well as for the support provided by Peter Mills during this time."

Potential to impact on Defra-led animal regulations

- As shown in *Table 2.3* the dialogue may also impact on aspects of secondary legislation that reflect the participants' concerns. A Defra team has started work on detailed drafting of supporting regulations on animals. They report that the findings from the dialogue prompted the publication of a [second factsheet](#) aiming to provide more details and reassurance around the animal welfare framework of the Bill.²⁰ Fleshing out this framework is expected to take about two years. The team intend to continue taking dialogue findings into account as they prepare drafts.
- BBSRC will now take on the role of providing Defra with support and advice. As a first step, Defra has Scotland's Rural College (SRUC), which receives funding from BBSRC and who was represented on the OG, to carry out [research to support the development of the application process for animal marketing authorisations and the welfare assessment that notifiers will have to carry out](#). The project was completed in May 2023 and involved engagement workshops with industry stakeholders and animal welfare NGOs.

Potential to inform FSA's work on authorisation of precision bred foods

- FSA is tasked with setting up a separate authorisation process for food and feed brought to market that has been derived from PB plants or animals. Their responsibility is to ensure that PB products will be at least as safe as their conventional counterparts. Through its membership of the OG, FSA has taken note of the dialogue findings and found them to resonate with their own public engagement on PB Products. This has involved [a large scale quantitative survey](#)²¹ (4177 respondents) followed by [a citizen's forum](#)²² (with 97 participants). The work focused mainly on plants and the public as consumers, but generated some findings on animals which chimed with the GEFA dialogue. In particular on the call for strong regulation, robust risk assessment and clear and transparent information:

"Participants felt that all precision bred livestock should be subject to Tier 2 regulation and assessment, or subject to a separate bill and regulation system entirely due to the common opinion that precision breeding in livestock is far less acceptable and possibly

²⁰Genetic Technology (Precision Breeding) Bill Precision Breeding and Animal Welfare – Future Framework [AnnexAAnimalsPolicyUpdateOctober22.pdf \(parliament.uk\)](#)

²¹ FSA and Ipsos [Survey of public attitudes towards precision breeding](#), July-August 2022.

²² FSA and Ipsos citizen forum with 97 participants from across the UK who met twice for half day online sessions and discussed hopes, concerns and suggestions for regulation of precision bred foods and feeds. .

riskier than in crops. Some also felt that precision bred livestock should not be permitted at all.” | FSA.

- The implications of public engagement in light of FSA’s role in developing secondary regulations was considered by the FSA’s Board at its March meeting. The report [on the implications of the PB Bill²³](#) highlighted the need for FSA to develop an authorisation system which is able to work in a relatively light touch way for low risk products, with more detailed assessment for higher risk products. Initially OG interviewees felt that FSA was likely to consider a broader sustainability approach for GEFA products which would allow environmental, ethical and animal welfare risks to be considered as well as the human health and safety risks they currently consider. This approach was in tune with what the GEFA dialogue participants were calling for. It now looks more likely that only animal welfare will be added to FSA’s usual focus on human health risks. However, proposals for developing a central register, tracing system and PB labelling for consumers are still under consideration. The details will be consulted on in 2024.

Box 2.3: Areas where the dialogue findings may still have impact

Findings from the dialogue	Likelihood of direct policy impact
Listing public benefit reasons for using GEFA	No explicit statement in the PB bill that GEFA should only be used for public benefit and safeguarding animal welfare, but both Defra and FSA processes will encompass animal welfare.
Ensuring animal welfare standards higher than current farming standards	Defra note on role of an Animal Welfare Advisory Body membership suggests it will include animal welfare organisations. Defra funded SRUC research will advise on the development of the application process and may include parameters around risk thresholds for adverse effects on animal health and welfare for different species which go beyond current Defra framework. This could potentially include the dialogue findings about the rights of farmed animals to a “good life”
FSA risk-based assessment of PB products brought to market	The FSA’s Advisory Committee on Novel Foods and Processes (ACNFP) is proposing a two-tier system. Based on their own public engagement animal PBs should be considered high risk. Although the risk assessment now seems unlikely to cover the full scope aspired to by dialogue participants (including wider environmental and ethical/benefit sharing issues) it is likely that animal welfare impacts will be included.
Providing consumers and producers with transparent information	Dialogue findings suggested the public wants more transparency about where PB has been used. FSA engagement suggested support for a central register, tracking system and labelling of PB products. The FSA Board paper (March 2023) recognises that these could be elements of the transparency and confidence building needed to create trust in PBs. Board members held different views on the pros and cons of each and the detail (practicalities, costs, risks of cluttered labelling, impacts on trade etc.) which will be explored with stakeholder 2023-4.

2.3 Potential research impact

“The UK has renowned expertise in animal bioscience and as the main public funder in the UK, BBSRC plays a pivotal role in ensuring that research and policy in this area is well-informed by a broad range of views and perspectives. BBSRC welcomed the opportunity to

²³ <https://www.food.gov.uk/research/consumer-perceptions-of-precision-breeding-executive-summary>, Mar 2023.

work alongside Nuffield Council on Bioethics and Sciencewise to support this crucial public dialogue - a dialogue that not only helps to inform future policy decisions, but that also offers a valuable contribution towards the future development of a world-leading regulatory system." I Professor Melanie Welham, Executive Chair, BBSRC, Foreword to dialogue report

- BBSRC expects the dialogue findings to be helpful in informing a broader strategic approach to the use of genome editing in its food and farming theme, extending the current plant focus into gene editing in animal related research.²⁴ The current strategy mentions GE in general and animal welfare but stops short of identifying priorities in this area. Other findings from the dialogue will now be shared via BBSRC strategic advisory panels, the council and executive leadership team.
- Key messages for BBSRC include the findings that: the public are interested in animals in science and farming and seem to find policies²⁵ and regulations governing use of animals in the lab satisfactory.²⁶ But when it comes to GEFA they would like to see research considered in the wider context of challenges faced by the farming system, and alongside other potential solutions which might be behaviour-led (such as eating less animal products) or involve non-GEFA technologies.
- The findings on pros and cons of different potential GEFA applications suggested a fair degree of consensus about a hierarchy of priorities: these have been shared with strategically funded research institutes as shown in *Table 2.2*.
- Roslin Institute and SRUC (University of Edinburgh) were closely involved in the dialogue: individuals sat on the dialogues and contributed as specialists. Those interviewed for the evaluation welcomed the opportunity to describe their work to public participants and hearing about participant's preferences for the direction of future work. They have also shared the findings with immediate colleagues – including through a well-attended lecture delivered by the NCoB project director - and with their wider academic and farming networks. As noted above, SRUC has carried out research on behalf of Defra as a first step in helping develop the animal welfare aspects of secondary legislation.
- Other institutes such as Pirbright and Rothamsted were less involved but are already doing some work on GEFA. Although we found no evidence that they have reviewed the dialogue findings, they have welcomed the passing of the PB bill.²⁷
- An evaluation interview with a commercial breeder working with these research institutes on GEFA applications confirmed that dialogue participants' expressed preferences for GEFA to first be applied to animal welfare applications (e.g. through that increase disease resistance) fits well with current collaborations on pigs and poultry which are thought to be the closest applications to market, although this is not envisaged for at least five years.

²⁴ BBSRC's current position statement on new genetic techniques focuses on crops and broadly reflects government thinking reflected in the Plant Breeding Bill, that the risks and benefits of GE plants are associated with the changes they induce in organisms, rather than the technology used to achieve them.

²⁵ <https://www.ukri.org/publications/the-use-of-genetically-modified-animals-in-research/>

²⁶ Regulations for research on animals (ASPA) were discussed in the final workshop alongside the PB bill and FSA risk assessment approach. A number of small groups were able to call on an RSPCA specialist to answer their questions on whether the regulations are robust and well implemented.

²⁷ Cefas, Roslin Institute and Hendrix Genetics work on salmon to improve resistance to Infectious Pancreatic Necrosis virus and Imperial College London, Pirbright Institute, and Roslin Institute work on resistance to avian flu in chickens. Roslin is also working with commercial breeders Genus on PRRS,

Table 2.2: BBSRC plans to share dialogue findings and potential for research influence

Potential area of impact	Messages
BBSRC Strategic Research	<p>Sharing key messages with</p> <ul style="list-style-type: none"> • Strategic Advisory Panels (official external engagement) • BBSRC Council • Executive Leadership Team <p>Key messages so far:</p> <ul style="list-style-type: none"> • Continue with work that situates specific research and innovation within the wider food and farming systems • Feed dialogue findings into bottom up funding areas, as opportunities arise
Informing priorities of strategically funded institutes working on GEFA	<ul style="list-style-type: none"> • The findings and report shared by NCoB and BBSRC • Expected to influence research priorities (animal welfare and public benefits ahead of productivity) via Policy and Engagement forums (Roslin, Pirbright and Rothamsted Institutes).
Roslin Institute	<ul style="list-style-type: none"> • Findings and implications shared by NCoB director at an informal meeting and via a well-attended formal meeting with the team • Report shared with colleagues by the OG member • Results shared with users of Edinburgh’s large animal facility
Scotland’s Rural College (SRUC)	<p>Key messages taken that participants do not want to see GEFA simply used to existing husbandry problems. And that they consider it a moral duty to give animals ‘a good life’ that goes beyond the traditional animal welfare focus in deciding whether GEFA is acceptable. Messages have been shared with external partners including:</p> <ul style="list-style-type: none"> • Waitrose in developing aims of selling only animal products that have a ‘good life.’ • Scottish Government in discussions about animal welfare beyond health <p>Detailed study for Defra on animal welfare to detailed regulation completed summer 2023.</p>
Helping inform priorities of commercial breeders	<ul style="list-style-type: none"> • Individual representing commercial breeder perspectives sat on the OG, acted as specialist during workshops and contributed to the POST report and PB Bill process. • Participant preferences for GEFA applications to address disease resonates with current joint academic/commercial research. • Process helped highlight the need for public and policy makers to have a better understanding of conventional breeding before developing regulations on traceability and labelling.

2.4 Potential to encourage further use of public dialogue

Policy makers

- **The Defra team responsible for developing the regulations recognise the need for further public engagement before secondary legislation is presented for parliamentary scrutiny.** The team intend to continue referring to the dialogue findings when designing further public engagement, but their plans for what form this will take will not be developed until late 2023.
- **FSA is already working with a range of stakeholders** to flesh out recommendations on traceability and also running workshops on the authorisation and the application process, enforcement, and a potential register. We understand that the initial focus is on

PB plant products – which could be brought to market in the next two years – but also for PE animal products, even though these will take longer.

- Before detailed proposals are put to ministers the FSA Board recognises they will need to engage with the public to test that proposals will provide the transparency they are looking for, and that PB products will be seen as trustworthy. Consultation is planned for 2024, but again it is not clear what form it will take. If FSA opts for public dialogue they are expected to have the capacity to commission and manage this work without Sciencewise support.

Commissioners

- **NCoB shared its key lessons from running this public dialogue at a UKRI Sciencewise workshop with policy makers in Spring 2023.** Overall the team found *“It has been a good experience that confirms public dialogue is valuable. A key lesson has been finding the [right] timing to engage for maximum policy impact.”* Since June (when the project director moved post) GEFA is no longer a key strategy area for NCoB. However, partly based on learning and capacity built through this process, public dialogue continues to be a key engagement methodology in other focus areas.²⁸
- **BBSRC is committed to public engagement as part of UKRI’s public engagement strategy (Nov 2022).**²⁹ As a result of taking part in this dialogue, useful lessons about commissioning, framing and timetabling of processes which will be applicable to future dialogues (see *Section 4*) have been identified. Lessons learnt will also be shared with other interested research councils via UKRI’s internal Public Engagement Research Network (PERN).
- With the recent appointment in BBSRC of a Head of Engagement, public engagement strategy may be revisited. For example this may reiterate options for public engagement in BBSRC’s competitive research and innovation strategic initiatives. Based on the success of this dialogue, BBSRC may also be interested in running thematic public dialogues that are applicable to more than one research project (although no specific opportunities have been identified at this stage). BBSRC does not currently have the capacity to undertake further dialogues without Sciencewise support.
- **Other academic organisations and NGOs** involved in the dialogue shared feedback that they were impressed with public dialogue as a methodology: one (RSPCA) felt it quite likely that they would use public dialogue as a methodology, others (Roslin, London School of Tropical Hygiene) reported that they would like to use such techniques in their research given access to sufficient resources (but were unlikely to have such opportunities in their current posts). One observer particularly valued how dialogue allows:
“participants to develop and strengthen their own views by engaging in conversation with other members who hold widely different world views... while challenging to ensure equitable participation of all members, this space for deliberative and iterative

²⁸ Ongoing public dialogues include assisted dying and AI for Genomics.

²⁹ UKRI public engagement strategy outlining public engagement priorities and objectives, Nov 2022.

<https://www.ukri.org/publications/ukri-public-engagement-strategy/>

development of opinions was extremely valuable in generating rich insights into the public's perceptions and priorities.

- As a result of sitting on the OG and seeing how dialogue can work, the British Nutrition Foundation (BNF) has gone on to commission Basis Social to undertake a mini dialogue with 30 students around healthy diets. The project, completed in late 2022, has benefitted from lessons learnt about participant recruitment, broad framing of the topic and working to realistic reporting timelines.

2.5 Potential for benefits to outweigh dialogue costs

Dialogue Costs

- This medium sized dialogue cost £231.3K (excluding VAT) in direct financial investment with an estimated further £45K of in-kind time contributions from the commissioners, OG members and specialists.³⁰ In this case, online delivery enabled the contractors to offer many innovative elements that could not have been delivered for the same budget face-to-face, even once additional time for online design and smaller group sizes (requiring more facilitators online) were factored in. Despite some slippage at the end, the dialogue was delivered on budget.

Potential benefits

- These costs are likely to be far outweighed by the potential benefits if the dialogue findings can help deliver secondary legislation to allow the PB Bill to deliver its intended aims of encouraging innovation to allow the UK to take advantage of a global market for gene editing estimated at £2.7bn in 2020 and expected to rise to over £7bn by 2026.³¹
- Indirectly, the findings from this dialogue and FSA's other public engagement could help shape a system for approving and marketing DP products that the public will find transparent and thus trustworthy, in contrast to previous experiences with GMOs.
- Testing the merits of proposed systems for assessing products, tracking them and labelling them will need to demonstrate that they pay due attention to animal welfare and public benefit and are able to deliver clear information that enables consumer choice. This will likely cost more than the £0.27 Mn spent so far, and will require further engagement to test whether proposed approaches are acceptable to the public. If so, the benefits to the UK economy could be considerable, opening up markets for PB products and adding value across the food chain. An effective labelling system might also help surmount trade barriers into countries that take a different approach to gene editing.
- But if the systems for regulation do not meet public expectations then, as one public participant put it: *"There are so many layers to this - ethical, diversity, health, environmental, cost, regulatory, transparency - it is paramount that the public are*

³⁰ Design, facilitation and incentive payments for participants and independent evaluation. Funding was provided by UKRI Sciencewise (£128.4K), and co-commissioners BBSRC (£82.3K) and NCoB (£20.6K) who also provided matching in-kind contributions in the form of officer time and hosting of the launch event (NCoB). Once in-kind contributions from the co-commissioners, OG members and specialists attending workshops (an estimated total of 90 days) are valued at an opportunity cost of £500/day, this is equivalent to an additional £45K (20%) on top of financial costs.

³¹ <https://www.gminsights.com/segmentation/detail/gene-editing-market>

involved in research because without their support the project in relation to them being a consumer could very well fail."

- The dialogue findings can also help priorities BBSRC's research funds towards research and innovation that will gain public support while contributing to positive impacts on global food security and delivering a sustainable, productive, diverse, resilient, and healthy agri-food system.³² As a member of the research community noted in evaluation feedback: "*It's important that we continue to have an open and honest dialogue with the public – if uses are not acceptable then there is unlikely to be funding for research as the public are the ultimate consumers.*"

³² <https://www.ukri.org/publications/bbsrc-strategic-delivery-plan/bbsrc-strategic-delivery-plan-2022-to-2025/>

3 Success factors in meeting the dialogue objectives

3.1 Objectives have largely been met

Table 3.1 shows that the dialogue fully met objectives (1,2 and 4) and that objective 3 was mainly met. The key contributory factors have been: an OG able to bring in all stakeholder perspectives; a very committed core project management team; the unusually wide framing of the topic; and high quality delivery including an iterative design, varied and engaging background materials, access to a wide range of specialists and a skilled facilitation team. These factors drew in a diverse group of participants and kept them very engaged in the topic. They were quickly able to switch from thinking as consumers to citizens and come to nuanced and considered views.

Table 3.1: How far objectives have been met

Objective	How far it has been met
1. To identify and understand the values citizens use to frame their views on genome editing in farmed animals to provide context for understanding wider public interest on this topic.	Fully met. Framing within the broader food system and future challenges allowed a large and diverse group of participants to explore underlying values about animals in the farming system and confront some inconsistencies between their concerns and food choices. The Commissioners and OG members valued the broad framing as evidenced by comments in the House of Commons and OG interviews (see <i>section 2</i>).
2. To map the values and principles that underlie dialogue participants' views on genome editing in farmed animals offering insights into how views are formed.	Fully met. The design prepared participants to apply their values into a wide range of potential GEFA applications (from animal welfare to human health, environment and climate change). Skilled facilitation prompted participants to explore the underlying values and principles that drove their preferences for different applications. The space to compare these to other non-GEFA solutions and to review what others had said in their own time added depth to the findings. The implied hierarchy of applications mostly sat well with key audiences and preferences for animal welfare were widely cited as key findings.
3. To explore, interrogate and understand conditions of consensus and disagreement among citizens	Partially met: areas of consensus and disagreement were described, but not to quite the level of analysis commissioners/OG hoped for. This was partly due to design choices (e.g. not including a specific session or prioritisation exercises to surface consensus/ disagreement, and keeping small groups together throughout, perhaps leading to greater appearance of consensus as individuals anticipated what they thought others would say). Useful data was generated through other exercises (e.g. an Engagement HQ survey and AI bot survey) but this quantitative data was only partially integrated into final analysis and reporting.
4. To identify areas of public aspiration, interest and concern including with respect to animal welfare and the marketing of animal products.	Fully met. Animal welfare was a key thread throughout the 4 workshops and some participants became very interested in how animal welfare is measured and regulated as they learnt more. The messages to policy makers were coherent and nuanced. Messages that a joined up regulatory approach is needed from lab (seen as sufficiently robust) to farm (seen as poor) to plate (the PB Bill), that animals should have a 'good life' and that strong risk assessment incorporating animal welfare is needed before products are brought to market landed well with key audiences.

3.2 Key factors which have contributed to meeting the objectives

3.2.1 An Oversight Group that reflected all key perspectives

- **The OG was large enough that all perspectives from industry, government, academics and non-governmental organisations were represented.** NCoB and BBSRC were flexible to suggestions from OG members that the perspective of industry was missing and worked to address this concern. As a result OG members felt it brought together "*a good spread of opinions – generalists and specialists - so important to the robustness of the process*" while the core team found it "*helpful in understanding the lay of the land and areas of hot debate.*" The breadth and seniority helped to ensure that key audiences found the process robust and findings credible.
- **Overall excellent chairing and behind the scenes support from NCoB helped ensure that all members were able to contribute** as individuals had expected based on the Terms of Reference (TOR). Members appreciated "*the opportunity of helping to shape the questions put to the public in the dialogue*" and felt they had helped "*ensure that information shared with participants was accurate and covered the necessary ground.*"
- **The group also contributed more directly to sharing information with participants than in most dialogues.** A handful of members (from across the spectrum of views) contributed content via self-filmed vox pop videos or as specialists at workshops. Their contribution was important since NCoB's previous stakeholder engagement and the compressed timetable during the design stage meant that there was less stakeholder input to designing materials than in most Sciencewise public dialogues. Some OG members were surprised to be asked to contribute in this way: but most were happy to do so wherever the tight deadlines between workshops allowed.
- **The size, seniority and breadth of opinions also created some challenges.** The numbers involved made it difficult to arrange the first meeting (which also coincided with Covid restrictions) or to sync later meetings to the most useful points in the process. Some members were tempted to use their platform to present their organisation's positions (although they had been briefed not to) which sometimes led to contradictory advice on hot issues (such as animal welfare and current breeding practices in commercial farming) which the lead designer from the dialogue contractor team found difficult to resolve.
- In ideal circumstances the first meeting would have been face-to-face with sufficient time to clarify expectations and agree a realistic timetable for OG inputs. In retrospect, some OG members may have been more suited to other types of stakeholder engagement (e.g. 1-2-1 interviews, generating stimulus materials or as specialists at workshops) rather than oversight roles.

3.2.2 An experienced core management team willing to work to tight deadlines

- **The core project management team together brought a wealth of prior experience of running public dialogue and/or policy processes, knowledge of agri-systems and GEFA.** NCoB and Basis' previous experience from the mini dialogue made it possible to pull together designs and stimulus materials within the challenging timescales. But working with a team leader and designer with an intellectual and emotional attachment to the topic sometimes made it difficult for the contractors to

take on the advice of the commissioners. This sometimes caused tensions with the commissioners and amplified the last-minute nature of the sign-off process.

- **The core team all invested time over and above what had been budgeted and their dedication was an important factor in making the broad framing, iterative design process and ambitious timelines work.**

3.2.3 An online format enabled recruitment of a very diverse group of participants

- Online recruitment methods and online workshops made it possible to recruit participants who not just reflected the demographics across UK locations but also represented a spectrum of food habits, religious beliefs and attitudes to animals in science that the OG felt necessary. Filling quotas across so many criteria would have been extremely challenging using on-street methods and would have been more costly if venues, refreshments and travel costs for participants, the contractors, specialists and OG members had to be included.
- Overall numbers were lower than planned (of 88 recruited 70 attended all sessions) but online delivery and the two week break between sessions allowed gaps after workshop 1 to be filled with new participants who were brought up to speed via a small catch up workshop. Small groups (4-6) were kept together across all sessions and appeared to gel well, with new recruits appearing confident to contribute from the outset. However, as noted below, this also had its downsides in limiting exposure to the diversity of backgrounds and opinions in the wider group. As one OG member observed in this case:

"Zoom worked really well and not only made it possible to bring together people from across the country but seemed to help draw out people who might not have said much in larger face-to-face groups because they felt comfortable in their own homes: open and friendly facilitation also helped."

3.2.4 A broad framing and iterative design approach

- **A design which started broad within a food systems context before focussing on GEFA applications avoided frustrations which can arise if a dialogue is too tightly focused on one technology.** Commissioners and all OG interviewees agreed the framing had allowed participants to think about GEFA in round, helped in the journey from thinking as consumers to citizens and helped create confidence in the process.
- **The iterative approach mainly struck the right balance between meeting commissioners' objectives and being responsive to participants' interests.** Moving from a skeleton overall design to detailed designs in the fortnight between workshops allowed the contractor design team to respond to what participants wanted to discuss³³ and fill any gaps in the types of specialists they wanted to hear from. The lead designer responded to a clear interest in talking about non-GEFA solutions by feeding back some of the solutions that had been discussed in small groups in the form of an online survey. Participants appreciated this sign that they had been heard and valued: the findings from this exercise enriched the data.

³³ For instance, opportunities for participants to talk about alternative (non-GEFA) fixes to the food system - such as reducing waste or meat consumption - were built into workshop sessions and homework tasks once it became clear this was a strong interest.

- **There was a trade-off between time for participant-led discussion and giving them an in-depth understanding of the technology.** A few OG members were concerned that not enough time had been dedicated to giving participants an in-depth understanding of existing breeding techniques.³⁴ However, it was clear from observing their conversation in the small groups and their reflections online that, that participants certainly grasped key concepts and were able identify wider societal issues associated with different GEFA applications. By the end of the process their views were “*sensible and considered*” (Daniel Zeichner, MP) based on a nuanced understanding of how the relative benefits and risks of different applications might be distributed.
- One downside of the way iterative design was approached in this dialogue – with detailed designs and materials only available to the core team shortly before the workshops - was in making it difficult for the core team to spot where a specific objective to explore areas of consensus and disagreement (objective 3) could have been more purposively built into the design (e.g. through a specific exercise or discussion to explore areas of consensus and disagreement).

3.2.5 Innovation and Good Practice in delivery

Timings allowed for plenty of deliberation in small groups at times that seemed to work for most participants

- Most participants reported that the overall length of individual sessions felt about right and OG members particularly admired how the design had created “*space for deliberative and iterative development of opinions....this dynamic was extremely valuable in generating rich insights into the public's perceptions and priorities.*”
- The only session which felt rushed was the final workshop which introduced a new, complex topic – regulation and governance – without enough time to tease out principles that participants would like to see applied across all regulation. In retrospect this session could usefully have been longer, broken into shorter sessions, or participants could have been asked to review background information in advance.
- We did not ask participants their thoughts about committing four Saturday mornings over such a long period as people emerged from Covid restrictions. However, in retrospect a mix of session lengths (including some weekday evenings) over a shorter period might have seemed less daunting and reduced dropout rates.
- However, the two week gap did allow those who wanted to pursue their growing interest in the topic to do so through their own research and conversations with friends and family. Many took this opportunity, and some reported they had changed their diets to be more consistent with their values and concerns. This gave them a sense of agency.

Professional facilitation by an experienced pool of well-briefed facilitators provided continuity between sessions and ensured that all participants felt able to contribute and enjoyed doing so

- Clear discussion guides (to which facilitators had often made helpful suggestions during pre-briefing), and simultaneous notetakers enabled facilitators to focus on creating an atmosphere which encouraged dialogue. All participants seemed actively engaged,

³⁴ E.g. in understanding whether GEFA would produce traits/change the nature of the animal in a way that was fundamentally different from existing selective breeding techniques might achieve, albeit at a slower pace.

listening to and building on each other's points. Most conversations felt as natural as possible within the limitations of online meetings.

- Almost all participants felt the facilitation had been professional and effective. They felt they had been able to make their voices heard, enjoyed the process and felt they had learnt and contributed something valuable. On occasion it would have been nice to see facilitators taking visible notes so that participants could check that what they were saying was being captured: this might also have helped explore areas of consensus and disagreement.
- By the end of the process some small groups would have benefitted from being mixed up to keep very small groups (less than 4) viable and expose participants to wider viewpoints. This would avoid a slight tendency to anticipate what each would say and fall into 'group think.' that we saw on occasion. A number of participants reported they would have loved the chance to hear more from those different backgrounds.

Innovative design elements – dedicated share sites, an AI bot exercise and a future foresights workshop - made the most of the online format

- Engagement HQ worked well as a shared site for participants to review information, discuss it with friends and family and to deliberate further in their own time. Although such exercises were not mandatory (or reflected in the incentive thankyou payment) most participants appreciated the chance to reflect on what they had discussed.
- An exercise using an innovative AI bot (INCA) formally captured the views of nearly 150 extra people (friends and family of the participants) at relatively low cost. Participants found the exercise fun and the additional data could have been used to provide a wider context for qualitative reflections at a particular stage of the participant journey. Instead the exercise provided proof of concept, but the findings were not much reflected in the main report and were confined to a short annex meaning the exercise did not add as much value as it might have done.
- A future foresights workshop run by SOIF during the scoping phase helped the core team to identify future challenges for the global food system but would have been more useful if it had involved external stakeholders or OG members or if those involved had been given advance warning of the activities being planned by the contractor. The process identified generic food system challenges but did not contribute much to developing future scenarios for how GEFA could be used.
- Dedicated share sites (Teams) for the core team and OG (Teams, Engagement HQ) proved efficient for sharing information, coordinating inputs and tracking hundreds of comments on the draft report.

Information shared with participants was pitched at the right level and was varied enough (include material generated by participants and OG members and animated videos developed by Basis) to suit all learning styles and keep participants interested

- Participants photos³⁵ and OG self-recorded videos (edited by Basis and shared at workshops) felt participant-led and brought in wider perspectives at minimal cost, helping all to feel engaged.

³⁵ Public participants shared thoughts or photos demonstrating how they felt about animals in the farming system to Engagement HQ before the first workshop. OG members had the opportunity to film themselves talking about their hopes and concerns for the GEFA.

- Simple videos based around footage sourced from respected sources (such as BBC and Which?) with voice over by Basis provided a comprehensive background and made a welcome change from PowerPoint.³⁶ Had the timelines allowed, the contractors would have shot some of their own footage on farms or in labs where it was hard to find the right images. OG members felt materials portrayed the system in a realistic way and *“were as neutral as was possible in such a politicised area.”*
- However, as noted above, time for review was short and not all OG members had time to review materials in advance: some chose instead ‘correct’ inconsistencies (generally different perspectives on definitions or sources of data used by different organisations) during workshops, causing some confusion to participants. To address this Basis developed a short primer on data sources and areas where views might be contested between specialists. Participants found this useful in negotiating conflicting views, but ideally the topic could have been discussed and materials made available during an earlier session.
- Participants, nevertheless, almost all agreed that the information they heard felt balanced and unbiased. In combination with what they heard from specialists, friends and family and their own research by the end they almost unanimously felt they had been well enough informed to have made a valuable contribution.

A large group of specialists (16) from a wide range of backgrounds (scientists, animal breeders, agriculturalists, animal welfare spokespeople, ethicists, retailers, and government policy makers) exposed participants to a wide range of perspectives

- Specialists contributed via self-filmed video (OG members), a few formal presentations in plenary, but mostly by moving between small groups and contributing thoughts or answering questions when invited to do so by facilitators. Their interventions visibly shaped small group discussions on GE applications and animal welfare: participants found *“hearing from the specialists was a real positive”* and that *“they were reassuring when it came to ethical questions, especially RSPCA.”*
- Specialists also enjoyed the chance to hear from the public, observe the group dynamics and share their own perspectives in small groups. However, some specialists would have appreciated a more well-defined role and pre-briefing of facilitators so that they had a clearer understanding of how they could contribute to small group discussions. The design – with limited information sharing by specialists in plenary but too many small groups to make it feasible to spend much time in each – meant that some participants worried they might have missed out on important information or viewpoints (such as from NGOs perceived as more sceptical about GEFA).

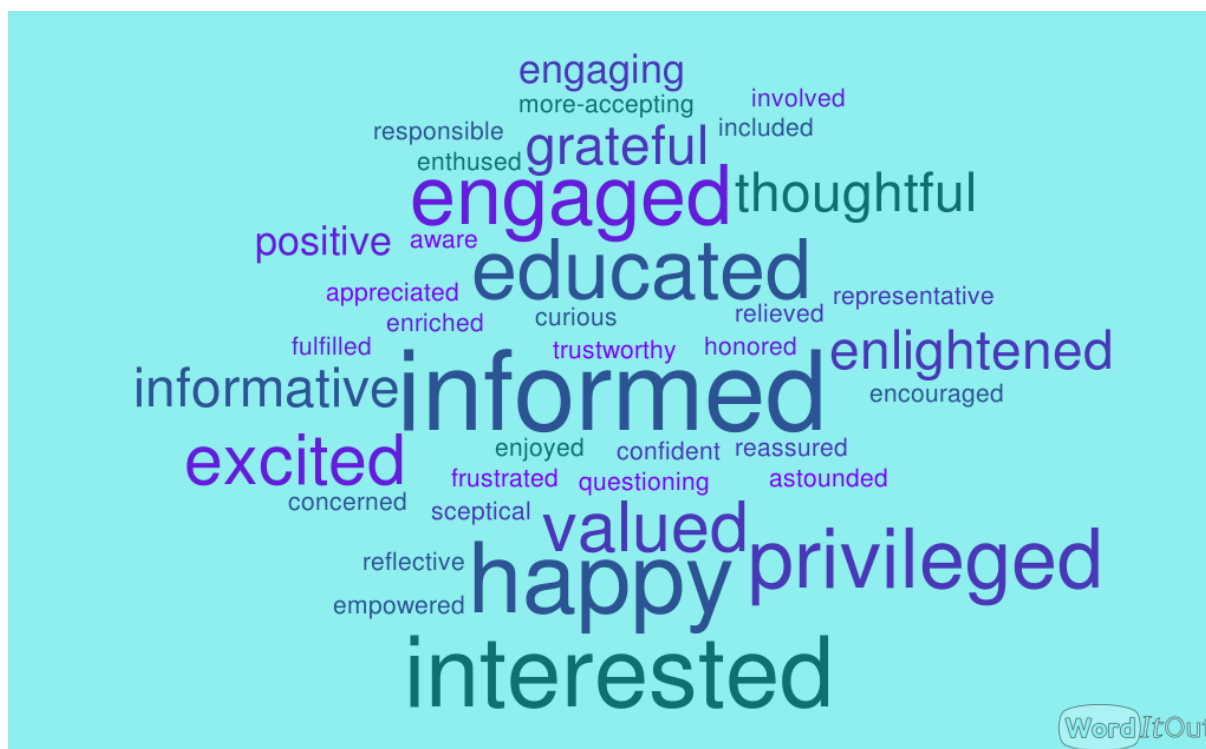
A commitment to involving participants in the later stages of reporting helped bring the findings alive for wider audiences.

- As shown in the word cloud below (and in detailed feedback in *Annex E*) almost all participants felt very appreciative of the opportunity to be involved. Beyond receiving a copy of the final report, many were keen to stay actively involved after the final workshop: the Basis team created some opportunities for interested participants to take

³⁶ In this case securing permissions for wider distribution at the outset would have made it possible to share the full stimulus materials at the Sciencewise or commissioner websites.

part in an editorial committee or to share their reflections at the launch event, Many volunteered for both roles. The three selected as panellists at the launch (two men and one woman) ably shared their thoughts on the process and their recommendations to policy makers, making clear that the public needs to continue being involved. All three said they felt well-prepared, comfortable and had relished their role: launch attendees found the chance to hear directly from public participants a highlight of the event.

Figure 3.1: Mind map of participant’s overall feelings about their involvement



4 Conclusions, lessons and recommendations

4.1 Conclusions

This medium sized, but complex dialogue, was designed to include many innovative elements and best practice in delivery. Ambitious deadlines had some impact in squeezing the time available for design, involving external stakeholders, review of materials and final analysis and drafting. Nevertheless, the dialogue was able to meet its immediate objectives of adding value to current understanding about the public's hopes, concerns and recommendations for how gene editing of farmed animals should be taken forward in the future. A timely and high quality report has also helped inform:

- The nature of the discourse around the UK Government's review of the Precision Breeding Bill. The findings are expected to have a more direct impact as both Defra and FSA develop detailed secondary regulations over the next few years.
- Findings will also help inform BBSRC's strategies, including around GEFA-related research priorities and its public engagement strategy.
- Organisations involved with the OG including Defra, FSA as well as the co-commissioners also appear more likely to use public dialogue approaches or take the lessons from this process on board in their future public engagement. Both FSA and Defra plan further public engagement, but it is not yet clear what form this will take.

Participants became very invested in the topic: some intend to follow through in changing their diets to address food system challenges; others are keen to keep following policy developments on GEFA; and most are keen to see the public continue to be involved in GEFA governance and regulation.

4.2 Lessons learnt

The key contributory factors to achieving the project objectives were: the unusually wide framing of the topic; the involvement of a large OG group representing many stakeholder perspectives; the hard work of a very committed core project management team; an online process that brought together a diverse group of 70 participants and made the best use of digital tools. The iterative design, accessible and engaging materials, involvement of many specialists, and skilled facilitation all helped participants to stay fully engaged and come to nuanced and considered views. The design also afforded opportunities for a handful of participants to play a role in the drafting and dissemination process.

The design also benefitted from innovative elements that made the most of the online format including: content generated by participants (uploaded images) and OG members (self-filmed videos); dedicated share sites for participants and OG members; a tailored AI bot survey; and a future foresight workshop.

4.3 Recommendations

4.3.1 For commissioners

Procurement, timetabling and sign-off

- Where a dialogue is designed to inform a specific policy process, ensure a realistic timescale – including contingency for slippage in the procurement process – so that findings can have maximum impact.
- Ensure timelines with milestones and responsibilities – including for sign-off processes within both commissioning bodies - are clearly laid out and kept updated, while maintaining some flexibility to respond to external events which may affect the dialogue's overall impact.
- Where commissioners have their own policies (as BBSRC does for making staff and contractors aware of potential areas where ethical conflicts may arise), consider sharing these in the invitation to tender.

Process design, Reporting, communications and dissemination

- Ask questions if it is not clear how all objectives will be fully addressed by the design. In this case the iterative design approach adopted led to very last minute sign-off and made it difficult to spot that the design would not fully surface the extent of consensus and disagreement between partners.
- Have early discussions on expectations of the final report (format, length, style, editorial voice, how different types of evidence will be used) to help streamline the final analysis and reporting process.
- In the final drafting stages, consider building in time to work with the contractors (e.g. in a workshop) to consider the implications from the first cut of the analysis and how they will be used to structure the final report.
- Weigh the pros and cons of an online vs. face-to-face launch event. In this case an online webinar proved a cost effective and efficient means to disseminate dialogue findings to a wider audience. But allow time to rehearse technical logistics and presentations and anticipate questions that might arise so that they can be answered in the room.
- Build in an expectation that participants' views will be captured (on film or in person) to help bring the findings alive and to share findings with a wider audience (e.g. policy makers or the wider public).

Getting the most out of a large and diverse Oversight Group

- Ensure the OG group is in place, with a first meeting date agreed, soon after commissioning to reduce risk of delays.
- Where feasible, consider meeting face-to-face at least once, ideally for the first meeting. In this case a planned in-person meeting was thwarted by COVID restrictions.
- Allow for a longer initial meeting so that the group can work through their roles (as individuals providing guidance rather than as spokespeople for their organisational position), and how they are expected to contribute. Allow time and space to flush out contested viewpoints and hot topics and how these should be presented to participants.
- Ask contractors to set out a plan with realistic deadlines by which OG members will be expected to comment, and for opportunities to participate in other ways (e.g. to help generate content).

- Consider whether some organisations might more usefully be involved as stakeholders (e.g. in helping to identify key areas of debate, develop stimulus materials, contribute to foresight exercises or as specialists) rather than in an oversight role.

4.3.2 For contractors

Build in some design flexibility to respond to participants' interests

- Where dialogues intend to take a broad systems view and enable participants to look at the role and value of a technology within a wider system, be prepared to accept some uncertainty about the direction of the dialogue. Build in enough time after the initial workshop to address participants' interests (e.g. in filling gaps in the type of specialists they want to hear from).
- Where the topic is contentious or evidence is contested, consider building in an early session on data sources, how to interpret them and where to expect contradictory views.
- If there is no time for a formal public pilot, make use of the accumulated experience of facilitators to 'pilot' the workshop flow and materials.

Be creative to get the most out of online delivery

- Consider budgeting (for subscriptions, design, moderation and analysis time) for a shared microsite for participants. In this case Engagement HQ worked well as a repository for materials and a space for participants to review materials and complete additional individual deliberative tasks in their own time: participants welcomed these opportunities, but in other cases it may be necessary to financially incentivise tasks outside the main workshops.
- Tools such as AI bots appear to offer cost effective options for complementing qualitative research (e.g. in testing how far participant views and recommendations might be shared by other publics) or to make any follow-on quantitative surveys with statistically representative samples more engaging.

Use a variety of formats for sharing background information with participants

- Pre-recorded videos - combining photos, footage (whether from other sources or self-filmed) and text with voice over – are more engaging than PowerPoints.
- Self-recorded vox pop videos can be a cost effective means of generating content from OG members and participants. Consider also using this approach (or filming zoom interviews) with specialists or to create vox pops for launch events.
- Try to secure permissions for wider circulation (from participants, specialists, broadcasters etc.) in advance so that stimulus materials can be shared at Sciencewise and commissioner websites and made available for other public engagement processes.

Enable specialists to contribute in ways they and participants find satisfying

- While developing the skeleton design framework identify the specialisms/perspectives which are likely to be needed and a long list of individuals who could address them: line up as many as possible before field work starts so that only gaps identified by participants need to be filled between workshops.
- Design in a clear role for specialists that allows all participants to hear all key information and a mix of perspectives and build in a clear briefing process (e.g. a discussion with the project director followed up with a written brief). Consider the pros and cons of different

approaches including vox pops, panels, plenary Q+A sessions or answering questions offline.

- Introduce specialists in plenary so that facilitators and participants know what their areas of interest are before they join their small group. Ensure robust and firm facilitation, and smooth logistics of moving specialists between online groups so that all are able to make best use of their time together.

Allow sufficient time for the final reporting process

- Allow for the fact that online dialogues – particularly where they include surveys and individual deliberation - can generate a huge volume of data which may require more time and resources for analysis and reporting than in-person dialogues.
- Consider running a face-to-face workshop with the core team after the initial analysis to help identify important themes, agree a report structure, writing style, how different types of evidence will be used and the level of analysis expected. Time invested at this stage will help reduce the number of iterations to finalise the report.

Involve participants in bringing the findings alive for wider audiences

- For either online or face-to-face launch events consider recruiting a small group of “participant panellists” to share their experiences and takeaway messages. Allow time for briefing and rehearsals. Consider recording the event so that it can be shared by the commissioners (e.g. on YouTube or for policy briefings).
- If budget allows, consider commissioning a short film with participants to share their experiences and reflections which can be shared with wider audiences.

Annex A: Oversight Group members

Sarah Mukherjee (Chair)	CEO, Institute of Environmental Management & Assessment
Penny Hawkins	Head, Animals in Science Department, RSPCA
Helen Ferrier	Chief Science and Regulatory Affairs Adviser, National Farmers Union
Laura Marshall	Head of Science Policy, Royal Society of Biology
Steve Morgan	Genetic Resources and GM Team, Defra
Chris Brown	Sustainable Business Director, ASDA
Jef Grainger	Associate Director – Thematic Research Challenges, BBSRC
Jonny Hazell	Senior Policy Adviser, Royal Society
Craig Lewis	PIC Genetic Services and Chair of the European Forum of Farm Animal Breeders
Louise Payton	Senior Policy Officer, Soil Association (Louise attended certain sessions in place of Jo Lewis)
Jo Lewis	Policy and Strategy Director, Soil Association
Michelle Patel	Acting Deputy Director, Analysis and Insight, Food Standards Agency
Chris Price	Chief Executive, Rare Breeds Survival Trust
Chris Proudfoot	Research Fellow, Roslin Institute
Sara Stanner	Science Director, British Nutrition Foundation
Anna Taylor	Chief Executive, Food Foundation
Pat Thomas	Director, Beyond GM/A Bigger Conversation
Emma Walton	Researcher, London School of Hygiene and Tropical Medicine
Francoise Wemelsfelder	Professor of Animal and Veterinary Sciences, Scotland's Rural College

Annex B: Additional independent specialists who contributed to the public workshops

Julian Baggini	Philosopher and journalist
Phil McNaughten	Professor of Technology and International Development Wageningen University
Rob Fraser	Emeritus Professor of Agricultural Economics, University of Kent
David Rose	Professor of Sustainable Agriculture, Cranfield University
Jonathan Birch	Associate Professor, Department of Philosophy, Logic and Scientific Method, LSE
Liz O'Neill	GM freeze
Huw Jones	Independent consultant working on agri-industry applications of genetic and genomic tools
Bruce Whitelaw	Professor of Animal Biotechnology, Roslin Institute