



TOWARDS IMPROVEMENT OF **RUMINANT** BREEDING
THROUGH **GENOMIC** AND EPIGENOMIC APPROACHES

Grant agreement number: 101000226

H2020 – Research and Innovation Action

Deliverable 2.5

Approaches for societal dialogue on animal breeding

Due date of deliverable: M55 – December 2025

Actual submission date: M56 – January 2026

WP concerned	WP2	
Lead partner	Rasmus Mikkelsen	DemX
Author(s)	Rasmus Mikkelsen	DemX
Version	V1	
Dissemination level	PU: Public	

Call: H2020-SFS-2020-2

Topic: SFS-13-2020 • Genome and epigenome enabled breeding in terrestrial livestock

Start date of the project: June 1st, 2021

Duration: 60 months

End date of the project: May 31st, 2026

Project ID: 101000226



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000226.

Table of content

Summary	4
1. Introduction and foundations for a model of societal dialogue	4
1.1 Why a new approach is needed.....	4
1.2 Multi-actor grounding as a prerequisite for legitimacy.....	5
1.3 Acceptance as a conditional, evolving space	6
2. Components of the RoA Model as applied in RUMIGEN	6
2.1 Multi-actor Engagement (T2.1)	7
2.2 The ex-ante Room of Acceptance (T2.2)	8
2.3 Scenario Development (T2.3).....	8
2.4 European Citizen Consultation (T2.4)	9
Local country adaptation	9
Recruiting hosts.....	9
Local hosts and facilitation	10
Citizen consultation	10
The gains of deliberation.....	11
Citizen feedback informing the ex-post Room of Acceptance.....	11
2.5 Room of Acceptance ex-post.....	12
From longlist to a parsimonious set of dimensions.....	12
Specifying boundaries and (non-)compensability.....	13
Positioning the ex-post RoA in the RoA model	14
3. Strengths and Limitations of the Model	14
3.1 Scalability.....	14
3.2 Cross-country comparability	15
3.3 Multi-actor grounding	15
4 Key Takeaways.....	15
4.1 Early engagement importance.....	15
4.2 Methodological Insights.....	16
Scenarios must be neither too technical nor too abstract.....	16
Conditionality is essential to understand acceptance	16
Digital tools are effective for cross-country studies.	16
4.3 Governance-Related Insights	16
5 Outlook: Reuse of the Model Beyond RUMIGEN	17
5.1 Guidance/motivation on How the Model Can Be Applied Elsewhere.....	17

5.2 Proposed next steps	18
6 Conclusion	19
References	19

Summary

This deliverable presents the WP2 model for societal dialogue developed in the RUMIGEN project and synthesised in Task 2.5. The overarching aim of WP2 is to help ensure that future ruminant breeding approaches can be developed within boundaries that are, in principle, acceptable to relevant stakeholders and European citizens. Rather than seeking a binary verdict on individual technologies, the model is grounded in the premise that acceptance is conditional, context-sensitive and shaped by interacting values related to animal welfare, environmental sustainability, governance, and the distribution of benefits and risks. The deliverable outlines a structured methodological flow consisting of a desk-based literature review, multi-actor engagement, the construction of an ex-ante Room of Acceptance (RoA), scenario development, citizen consultation across multiple European countries, and the refinement of an ex-post RoA. The ex-post stage is highlighted as a key consolidating step that transforms a broad, stakeholder-informed framework into a usable tool by reducing the dimension set to seven opposing positive/negative pairs and clarifying which concerns appear more negotiable and which may function as hard boundaries.

The novelty of the WP2 approach lies in operationalizing societal acceptance as a conditional, multidimensional space rather than as an attitudinal response. The Room of Acceptance framework integrates stakeholder and citizen deliberation into a structured ex-ante/ex-post model that identifies both negotiable trade-offs and non-negotiable societal boundaries.

1. Introduction and foundations for a model of societal dialogue

Work Package 2 (WP2) in RUMIGEN addresses the societal conditions for the development of future ruminant breeding approaches. Its overarching aim is to help ensure that breeding strategies explored in the project can be developed within boundaries that are, in principle, acceptable to relevant stakeholders and to European citizens and consumers. This does not imply that WP2 can or should guarantee acceptance of particular technologies. Instead, the work package seeks to clarify which combinations of aims, outcomes and governance arrangements are more likely to be seen as legitimate and responsible, given ongoing public concern about animal welfare, environmental sustainability, fair distribution of benefits, and the future organisation of European agriculture.

Task 2.5 and this deliverable plays a synthesising role within the work package. It brings together insights from Tasks 2.1-2.4 to articulate a coherent model for societal dialogue on animal breeding. This model integrates stakeholder input, structured conceptual mapping of acceptance boundaries, scenario-based reflection on plausible futures, and large-scale citizen engagement. The purpose of this deliverable is to describe that model, explain how its components connect, and outline how it can inform responsible innovation both within RUMIGEN and beyond.

1.1 Why a new approach is needed

A renewed approach to societal dialogue is necessary because breeding technologies are advancing rapidly, both within and outside the RUMIGEN context. Developments in genomics, gene editing, data-driven selection and reproduction technologies open new possibilities for improving animal health, resilience and productivity. At the same time, public expectations towards animal husbandry

and livestock production are evolving. Citizens increasingly link breeding to broader food system trajectories, including climate and biodiversity pressures, the protein transition, rural livelihoods and questions of corporate power in agricultural value chains¹. WP2's citizen engagement confirms that many participants situate breeding choices within these wider societal concerns rather than viewing them as purely technical matters.

Past controversies around GMOs and cloning demonstrate that even technologically promising innovations can be met with deep resistance if there is a lack of public dialogue, they are perceived to conflict with societal values or if governance arrangements are considered insufficiently transparent, trustworthy or fair (Marques, Critchley, & Walshe, 2015). These experiences indicate that societal dialogue must be anticipatory and integrated early into innovation pathways, rather than treated as a late-stage communication or acceptance exercise (UK Food Standards Agency, 2020). Conventional methods for assessing "public acceptance" are not well suited to this landscape. While attitude surveys can provide useful snapshots of current sentiment, they often reduce complex ethical and political reasoning to simplified positions. Binary framings mask the conditions under which people may be willing to support a given approach and do not capture how views develop when participants are presented with realistic trade-offs and alternative futures. Thus, one is provided with a current snapshot of sentiment, rather than insights that are more likely to reflect actual acceptance patterns in a real-world implementation. Moreover, technology specific questions can isolate breeding from broader system questions, even though citizens often evaluate breeding against wider visions for the future of agriculture. For these reasons, WP2 advances a model that treats acceptance as a structured, conditional field embedded in a wider landscape of interacting values. The central ambition is not to measure whether citizens are for or against breeding technologies in general, but to identify which conditions move particular approaches into or out of the space of perceived societal legitimacy.

1.2 Multi-actor grounding as a prerequisite for legitimacy

A key implication of this approach is that a credible framework for societal acceptance cannot be constructed in isolation or by researchers alone. What counts as acceptable is shaped by diverse, sometimes conflicting perspectives, both among citizens and across stakeholders in the animal welfare and food system. For example, farmers and breeders can contribute knowledge of feasibility and real-world constraints, NGOs and advocacy groups highlight ethical concerns and long-term risks, food companies and retailers raise issues of market dynamics and consumer trust, and regulators and policy stakeholders bring attention to governance gaps and institutional responsibilities. Finally, citizens can provide expert input in exactly the areas their expertise is most essential: they can contribute value-based judgements about desirable futures and the boundaries of trade-offs they consider legitimate.

In WP2, the Room of Acceptance (RoA) was therefore built through a multi-actor process. The starting point of this approach is a desk-based review of existing literature on public attitudes, ethical debates and governance challenges in animal breeding and advanced biotechnologies. This stage generates an initial set of candidate dimensions, including, in this particular case, concerns about animal welfare, environmental impact, transparency, control, economic resilience, fairness and the perceived purpose of breeding. However, these dimensions should be treated as an initial mapping, rather than a finished framework. Next, the dimensions are validated and refined through stakeholder engagement. Engagement with stakeholders through e.g. interviews, workshops and consultations

¹ CIT

allow a broad set of actors to challenge early assumptions, identify missing concerns, and adjust the phrasing and scope of dimensions so they are meaningful across different professional and ethical standpoints. In addition to refining the relevant dimensions, this exercise can also provide the first insights into the extremes of acceptability in each dimension. This step helps ensure that the RoA reflects practical concerns and conflicts of values, not only abstract debates visible in the literature. Finally, the refined dimensions are tested with citizens through scenario-based reflection. By embedding RoA dimensions in plausible future scenarios for European livestock and breeding, the citizen consultations explores how people reason about trade-offs between, for example, productivity, climate impact, sector structure and animal welfare. This step provides the data needed to set the final boundaries of each dimension, and anchors the RoA.

1.3 Acceptance as a conditional, evolving space

The combined stakeholder and citizen process highlights that acceptance is best understood as conditional and sensitive to context. Citizens rarely hold stable and unconditional endorsement or rejection attitudes to breeding approaches. Instead, this method recognizes the need to generate deep reflection and group deliberation, allowing citizens to evaluate breeding approaches in relation to aims, expected outcomes, and the credibility of associated governance structures, in line with previous thinking on the subject (Stilgoe, Owen, & Macnaghten, 2013). This understanding provides the conceptual foundation for the WP2 model. Rather than generating a single “acceptability score,” the RoA creates a structured map of boundaries, which specific technology implementations can then be placed within. This helps technology developers like the RUMIGEN project to understand where acceptance is robust, where it is fragile, and which conditions appear particularly decisive for societal acceptance. The model therefore shifts attention from a narrow focus on attitudes towards the technology itself, to a broader analysis that recognizes the importance of the implementation and context of the technology, in addition to its inherent traits. This brings focus to the governance, distributional and ethical requirements that shape public and stakeholder expectations. Taken together, these foundations justify the integrated WP2 model described in the remainder of this deliverable. The model combines:

1. multi-actor input
2. ex-ante construction of a provisional Room of Acceptance
3. scenario development to translate abstract concerns into plausible futures
4. large-scale citizen consultation
5. ex-post refinement of the RoA.

This creates a framework that can feed into breeding programme development in RUMIGEN and in other technology development applications by clarifying the conditions that citizens and stakeholders see as essential for legitimacy and trust. These concepts will be further developed below, where the specific implementation of the RoA model in RUMIGEN will be used as a case to exemplify the general structure and benefits of the RoA model.

2. Components of the RoA Model as applied in RUMIGEN

The table below provides a simple overview of the main steps in the RoA method, to make the flow of the method clear. Each step will then be covered more specifically, based on the way the step was implemented in RUMIGEN

Step	Purpose	Main output	How it feeds the next step
1. Desk literature review	Map existing debates, concerns, and evidence on breeding, governance, ethics, and public perceptions	Draft set of potential acceptance dimensions	Provides a research-based starting hypothesis for dialogue
2. Multi-actor engagement	Test, challenge, and refine the draft dimensions with stakeholders across the food/breeding system	Validated and revised dimension set	Ensures relevance, legitimacy, and real-world grounding
3. Room of Acceptance (ex-ante)	Translate refined dimensions into an initial structured “acceptability space”	Ex-ante RoA framework (dimensions + preliminary boundaries)	Creates a framework to structure and stress-test future visions
4. Scenario development	Make dimensions concrete by embedding them in plausible futures and trade-offs	Scenario set designed to probe boundaries	Creates meaningful deliberation material for citizens
5. Citizen consultation	Explore how citizens evaluate scenarios and conditional trade-offs across contexts	Citizen assessments + qualitative reasoning	Generates evidence about where boundaries hold or shift
6. Room of Acceptance (ex-post)	Update and strengthen the RoA based on citizen inputs (and triangulation with stakeholder insights)	Ex-post RoA with refined boundaries and priorities	Produces a more robust, societally grounded model for guidance and reuse

2.1 Multi-actor Engagement (T2.1)

The purpose of multi-actor engagement in WP2 is to ensure that the dimensions defining societal acceptance are not constructed by researchers alone, but grounded in the concerns, experiences and value frameworks of actors across the food system. In this sense, the step provides grounding, by bringing in real-world knowledge (by allowing stakeholders to challenge early hypotheses), and co-creation (by shaping both the scenario development and the Room of Acceptance (RoA) in ways that reflect practical and ethical tensions visible to actors in the field). Stakeholders contributed insights on technical feasibility, sector priorities, economic pressures, and governance challenges. Dimensions that are essential to understanding the conditionality of acceptance, but which cannot be derived from literature alone.

Multi-actor engagement was carried out through workshops and consultations involving representatives of farmers, breeders, veterinarians, NGOs, the food industry, and experts in ethics and biotechnology. These formats allowed for both structured feedback on predefined RoA dimensions and open-ended exploration of concerns not visible in earlier desk research. Workshops

were used to identify missing dimensions, re-frame ambiguous categories, and surface contested concepts. Further, participants helped to define both the outer extremes of acceptability in each dimension, as well as a first indication of the limit of perceived acceptance. However, it is important to note that these initial “scoring” exercises on each dimension were not intended to set final boundaries, but rather to give an early indication of where the boundary was expected to be. This was then used to design scenarios that challenged these boundaries with citizen input.

2.2 The ex-ante Room of Acceptance (T2.2)

An ex-ante Room of Acceptance was constructed through a comprehensive desk study reviewing public attitudes towards breeding, ethical debates, governance challenges and policy controversies surrounding advanced biotechnologies, as well as the early stakeholder engagement. This provided a preliminary set of dimensions, including animal welfare, environmental impact, transparency, control, economic resilience, fairness and the purpose of breeding, derived from academic literature, regulatory frameworks and previous participatory technology assessment, along with the data from the multi-actor workshop described above. At this early stage, the RoA functioned as a conceptual hypothesis: a structured but provisional map of concerns that require validation, refinement and contextualization. Thus, laying the necessary theoretical groundwork for developing the scenarios that were to be implemented in the citizen engagement. This RoA ex-ante has previously been submitted as a deliverable, where more detail is provided².

2.3 Scenario Development (T2.3)

With the RoA ex-ante in hand, four scenarios were developed, illustrating possible futures for European agriculture and its use of technology:

1. Full throttle towards livestock 2.0
2. Parsimonious breeding,
3. Status quo, and
4. Livestock: a social contract.

The scenarios on future breeding were the result of collective work carried out at the end of 2022 and during the first half of 2023. They were presented and discussed in groups during the annual meeting in June 2023 (Tolèdo, Spain, June 22 & 23th 2023).

For the citizen consultations in T2.4, it was decided to exclude the *Status quo* scenario to reduce complexity and overlap. Key elements from the scenario were integrated elsewhere in the survey when relevant. The remaining scenarios were adapted into three new versions:

5. The High Tech Scenario
6. The Precautionary Scenario, and
7. The Pastoral Scenario

The scenarios were transformed into short video narratives developed in collaboration with a graphic designer.

The scenarios in the videos are not exact, scientific projections of the future. Neither are they mutually exclusive. Trends from one scenario could occur in another. Their purpose was to illustrate

² CIT

three plausible but stereotypical future directions and support reflection on which trajectories citizens would prefer for European agriculture. The purpose of the scenarios in the citizen engagement was ultimately to present citizens, who may not live in close proximity to agricultural zones, or who may not have a clear image of the usage and purpose of technology (including breeding technology) in European agriculture, with a range of scenarios, in which technology plays different roles, resulting in different “realities” regarding scale of production, animal welfare, investments in technology and development within and outside the EU, markets and supply, and the agricultural landscape, which can be an important step in reflecting on future issues (Wiek, Binder, & Scholz, 2006) . Thus, the intention was not to have citizens provide sentiment indications to specific technologies, but rather to prompt reflection and debate around the dimensions identified in the RoA ex-ante, and then sampling these reflections.

2.4 European Citizen Consultation (T2.4)

Citizen engagement was carried out in nine European countries (with the vast majority of data being provided from eight countries: Bulgaria, Denmark, France, The Netherlands, Italy, Poland, Spain, and Germany, with a small sample from Belgium) through a deliberative process exploring citizens’ perceptions of the societal and ethical implications of new breeding technologies. The consultations used the *EuropeSay* method, where local citizens host small meetings (often in their homes) with people from their personal networks. Participants complete a mix of electronic surveys and guided discussions in their local language, facilitated through the proprietary *EngageSuite* platform.

This method combines wide geographic coverage with meaningful, locally grounded dialogue. Hosts recruit peers, creating a familiar and trusting environment that supports deeper reflection. The result is a dataset that captures underlying values, motivations, and reasoned preferences across diverse contexts.

Local country adaptation

Democracy x collaborated with recruitment partners in Denmark, France, Spain, Italy, Poland, Germany, Bulgaria, and the Netherlands. Each recruitment partner was tasked with recruiting 100 citizens in each country to take part in the citizen consultation. The specific task for the recruiters was to recruit approximately 20 citizens (“hosts”) to host a citizen consultation, each committing to invite 5-7 people to participate.

The recruitment partners received a thorough partner guide developed by Democracy x, including relevant information about the task and background on the RUMIGEN project. The partners were asked to make sure that the hosts receive instructions on their role, the event procedure, and the Guide for hosts, developed by Democracy x. It was the recruitment partners’ responsibility to ensure that the approximately 20 hosts carried out their meetings within a defined timeframe, and that they were assisted in any questions or technical problems they might have. If necessary, the partners would assist the hosts with setting up their meetings in EngageSuite. Some partners would also assist the hosts by joining the consultations in person.

Recruiting hosts

The hosts were chosen based on a range of criteria (age, gender, geographical zone of residency, educational level) intended to ensure diversity of the hosts. As there were only 20 of these meetings per country, full demographic representativeness was not possible. Instead, the recruitment criteria

should ensure diversity among the hosts. There were, however, no constraints to who the hosts would invite. In the end, 787 valid responses were received from citizens.

With this sample size and composition of participants, it is not meaningful for the EuropeSay methodology to aim for or make claims to statistical representativeness across all categories of the sample. Rather what it seeks to achieve is a rich and well-grounded picture of the tendencies in the population, both at the national and transnational level. Thus, the data collection is centered around sampling qualitative data from the reflections and discussions taking place within each group.

Local hosts and facilitation

Once the participants had been found, and a time and date has been set, the host would register the meeting on the EngageSuite platform, by following the guide for hosts, developed by Democracy x. The RUMIGEN citizen consultation was in most cases set up by the host with one shared laptop, which would facilitate the consultation, and where the videos were shown, but it is a requirement that all participants also have their own personal device with internet connection, which allowed them to answer individual questions simultaneously.

Citizen consultation

During the meeting, the participants would sit so that they could all see each other, and so that they can all see the screen of the hosts computer. The host would log on to EngageSuite and asks the other participants to go to the link they had received for the meeting on their own devices. After this, the participants would follow the instructions on the screen, reading the instructions out loud, to ensure a shared understanding. During the meeting, the host was a participant on equal footing with the rest of the participants.

The EngageSuite platforms offers a variety of embedded options for facilitating a local in-person dialogue, which is the purpose of the EuropeSay method. For the RUMIGEN citizen engagement, the consultation, facilitated through the EngageSuite Platform, included:

- A consent form
- A written introduction to the consultation
- A short demographic survey
- An introduction to RUMIGEN and to the topic for dialogue, including information on the agricultural system and its development in EU
- Ethical “baseline” questions
- Three scenario videos, each followed by a guide to group reflection
- Multiple choice question battery corresponding to dimensions in the Room of Acceptance ex-ante, followed by a guide to group reflection
- A written introduction to eight breeding technologies, followed by an individual likert-scale questionnaire
- Repeated question battery to capture shifts in views after learning about the breeding technologies, followed by a guide to group dialogue
- A questionnaire about ethics, regulation, and technology
- A creative group task, to design a “favorite future scenario”, including an upload button
- A short questionnaire about ethics and politics related to animal farming in the EU
- An open field for comments and feedback, and the option to allow the project to store e-mail addresses for similar surveys in the future
- An upload button for a group photo
- Optional questions for further discussion in the group

The consultation was designed as a mix of background material in writing and in video, individual questions about opinions, hopes and worries, group reflection exercises, creative task and encouragement to work together as a group.

A sample of the citizen consultation in the EngageSuite platform can be provided upon request.

The gains of deliberation

As described in section 1.3, the EuropeSay method used in the RUMIGEN citizen consultations is a method that allows engaging participants in deep reflection and dialogue, providing a deliberative room for the participants, which in turn allows them to provide responses based on reflection and deliberation. The participants were participating in a safe and familiar environment, often at a local café or in the home of one of their friends or families. Many chose to combine the consultation with dinner or drinks, which further eased the mood and allowed for a more free and open discussion among the participants, which could not have been achieved with a classical survey format. Thus, this approach is significantly different from traditional focus group interviews, which are typically hosted by an unfamiliar researcher and structured more formally. The intention with this format is that it provides the right social conditions for positive engagement with differing viewpoints and an ability to reflect and question own beliefs in an environment that is conducive to this type of collaboration.

The variety of tasks and the design switching between individual and group reflections, and written, video and discussions, meant that the participants were able to engage actively throughout the consultation, which in most cases lasted between 1 hour and 30 minutes and 2 hours and 30 minutes. At the same time, we were able to harvest individual answers to a broad range of questions, by mixing the group discussions with individual replies.

The group discussion served in large part to help to get ideas flowing and supporting richer dialogue. This led to participants developing more nuanced perspectives on the individual questions, which they had been able to reflect on in the group discussions. While this approach can raise concern that data might be biased based on group sentiment, pre- and post-discussion sampling of views carried out within the survey indicate that while discussion can create a tendency towards consensus, they do not generally influence responses in a way that fundamentally reverses stances on specific topics. In other words, to the extent that group deliberation biases individual responses, it does not generally do so to an extent that reverses sentiment within individuals³.

Citizen feedback informing the ex-post Room of Acceptance

As described above, the 23 dimensions derived from the initial workshops were discussed with 787 participants from 8 European countries. At the start of discussion groups, citizens were asked to prioritize the 13 negative and 10 positive dimensions in rank of importance to their views on a potential breeding technology. Participants were then introduced to 8 breeding techniques and were asked to reprioritise the dimensions. Analysis showed that there were minimal differences in dimension priority between the priority list before and after the discussions, indicating that the public has a stable range of priorities against which they evaluate innovative breeding techniques.

When discussing the breeding technologies in more detail, citizens broadly show precautionary opinions, with some explicit concerns that large companies will achieve a disproportionate amount of benefits from the implantation of new technologies, while societal promises are not met. Additional concerns related to neophobia which tends to be particularly prominent in food, and technoscepticism where citizens prefer technologies that are perceived less invasive and less “unnatural”

³ CIT

were also noted. The citizen engagement also showed that citizens are well aware that trade-offs can be necessary, which supports the notion that hard boundaries of acceptance are unlikely to provide a realistic picture of public acceptance. Rather, while some dimensions might have “hard” boundaries, in which any overstepping of the boundary would indicate societal rejection, some boundaries might be “soft” insofar as the transgression of these boundaries might to some extent be compensated for by “overachieving” on other dimensions. This indicates that societal acceptance can be dependent on societal dialogue that makes clear the relationship between dimensions and seeks to find an acceptable balance between dimensions.

It is also clear from the citizen engagement, that societal acceptance is dependent on the specific implementation of a technology. Acceptance is impacted by the amount of the benefits of technology implementation that accrue to smaller companies and farmers, society as a whole and end users in terms of product quality, and that good control systems are in place to deal with unforeseen impact.

In conclusion, and recognizing that citizen views have to be addressed, even if perceived to be unjustified by other stakeholders, and in light of the participants reasonable and nuanced views on the matter and the need to accept trade-offs as long as all stakeholders are treated fairly, we take the priorities participants voiced as indicators for the next stage of the ex-post room of acceptance without further normative evaluation of their opinion. While the discussion delivered insights into priority dimensions of participants and thus delivered dimensions of relevance to the final Room of Acceptance, further indications of how easily consumer citizens are willing to trade off the different dimensions against each other need to be created for which the next stage of the development of Room of Acceptance was used.

2.5 Room of Acceptance ex-post

The ex-post Room of Acceptance marks the point in the RoA model where an initially broad, stakeholder-informed framework is turned into a more focused, grounded and usable tool for guiding societal dialogue on breeding. While the ex-ante RoA provided a structured hypothesis about which dimensions matter for acceptance, the ex-post stage used the empirical work described elsewhere in this deliverable to test, consolidate and sharpen that hypothesis.

The ex-post RoA therefore has three main functions:

- To validate whether the original dimensions are meaningful and sufficient from a wider societal perspective.
- To specify boundaries and trade-off structures, including which dimensions can be compensated for and which act as non-negotiable constraints.
- To reduce and re-organise the dimensions into a parsimonious set that can realistically be used in future dialogue and governance settings.

Rather than introducing new topics, the ex-post RoA builds directly on the earlier stages of WP2 and answers the question: given everything learned, what does the “room” actually look like, and how can it be used?

From longlist to a parsimonious set of dimensions

The ex-ante RoA combined literature and stakeholder input into an extensive, multi-layered list of dimensions and sub-dimensions, covering aspects such as animal welfare, environmental impact, ownership and control, unforeseen risks, naturalness, necessity and distribution of benefits. This

longlist was valuable for mapping the conceptual space, but it was not yet suitable as a practical tool for dialogue or decision support. The ex-post stage used the empirical results from WP2 to consolidate this longlist into a smaller number of opposing “positive/negative” dimension pairs. Through prioritisation exercises and subsequent quantitative analyses, dimensions that overlapped or behaved similarly based on the citizen consultation were merged, and those that were consistently peripheral in public reasoning were either collapsed into others or dropped. The result is a refined ex-post RoA centred on seven dimension pairs, each with a positive and a negative pole. In simplified form, these are:

- Unexpected consequences
 - Positive: openness to spill-over effects and broader scientific benefits.
 - Negative: fear of unforeseen, “unnatural” outcomes and broken promises.
- Animal rights / natural life
 - Positive: respect for the animals’ right to live a natural life without pain or nuisance.
 - Negative: low priority given to natural behaviour and welfare.
- Quality and low in chemicals
 - Positive: higher product quality with reduced use of chemicals and antibiotics.
 - Negative: lower quality and more chemical inputs.
- Environmental protection
 - Positive: breeding that contributes to climate and environmental benefits.
 - Negative: breeding that ignores negative climate and environmental impacts.
- Openness / access (“open to all”)
 - Positive: development open to different companies, small farmers and developing countries.
 - Negative: concentration of control and benefits with a few large companies and rich countries.
- Price
 - Positive: lower prices for meat and dairy.
 - Negative: higher prices for consumers.
- General feeling
 - Positive: an overall optimistic expectation about advanced breeding technologies.
 - Negative: a general sense of unease or pessimism.

Together, these seven pairs define the dimensions of the ex-post “room” in a way that is both comprehensive enough to reflect the main lines of societal concern and simple enough to be communicated and used in practice.

Specifying boundaries and (non-)compensability

A crucial task for the ex-post RoA was to move beyond listing dimensions and to clarify how they function in acceptance judgements: which ones behave like “must-have” conditions, which ones allow trade-offs, and where boundaries between acceptable and unacceptable are relatively soft or hard. As explained above, the ex-ante work had already identified these as open questions: Can a negative score on one dimension be compensated by very positive scores on others? Are some dimensions effectively non-compensatory, i.e. “deal-breakers”? Do boundaries look the same across dimensions, or are some characterised by narrow “red lines” and others by broader grey zones? The ex-post analyses, including the adapted Kano-inspired approach to attribute types, provided several important clarifications. These primary findings were:

1. Unforeseen future consequences emerged as a prime concern that citizens are reluctant to trade off. Even strong benefits on other dimensions do not easily restore acceptability when people believe a breeding approach carries unknown or poorly managed long-term risks.
2. Animal welfare and environmental protection behave as strong “preferably positive” dimensions. While some respondents acknowledge trade-offs, there is a clear expectation that breeding strategies should not systematically worsen animal welfare or environmental outcomes.
3. Openness/access matters particularly in relation to newer and more advanced techniques: concerns about concentration of control and exclusion of smaller actors are more pronounced here than for established methods.
4. Price and general feeling appear relatively weak as explicit drivers in the public debate framing of acceptability. They contribute to overall attitudes but function more as background conditions than as decisive boundaries. This suggests that public controversy is more likely to be organised around issues such as unforeseen risks, welfare, environment and fairness than around consumer price.

Taken together, these results allow the ex-post RoA to indicate where the room has “hard walls” (e.g. unacceptable levels of unforeseen risk) and where there is more room for negotiated trade-offs (e.g. between modest price changes and improvements in welfare or environment). This does not resolve the trade-offs, but it makes them visible in a structured way.

Positioning the ex-post RoA in the RoA model

For the RoA model, the ex-post RoA provides the closing and conclusive step in the approach. This first implementation of a new method not only confirms that treating acceptance as conditional and multi-dimensional is empirically warranted, it also simplifies a complex conceptual space into a workable set of seven dimension pairs. Its finding that boundaries can be more or less “hard and distinguishes where societal expectations function as “red lines” versus negotiable trade-offs. This demonstrates usability, by showing how technologies can be profiled within the refined room. At the same time, the ex-post RoA remains open for further refinement. The ex-post report explicitly notes that a future stage of the method could involve returning to stakeholders with the citizen-grounded RoA, in order to complete the loop between expert, stakeholder and public perspectives and to test how well the refined room works as a shared reference point in concrete breeding programme decisions. In sum, the ex-post RoA transforms the earlier RoA work from a broad conceptual and stakeholder map into a tested, condensed and analytically sharper framework. This finalised room is what the present deliverable draws on when describing the results of the RoA model for societal dialogue on animal breeding and its potential use in guiding responsible innovation within and beyond RUMIGEN.

3. Strengths and Limitations of the Model

3.1 Scalability

This model was used nationwide among eight countries in the EU, but the method can be used anywhere in the world, where a stable internet connection can be set up. The citizen engagement component of the method carried out through EngageSuite has (in isolation from other elements of

the method described here) been run on samples as small as 15 and as large as 10.000, providing significant scalability and adaptability of the citizen engagement element of the method to specific assessment needs. In some regions, it may be useful or even necessary to put more emphasis on the role of the local hosts, whose responsibility is to invite peers, make sure that a stable internet connection is running, and to provide necessary devices, for example a tablet, smart phone or a computer with internet connection for each participant, or to be shared by the participants to reply to individual questions in the consultation. However, variations in recruitment conditions should be considered. In the RUMIGEN citizen engagement, some local recruitment partners succeeded in recruiting hosts with access to larger groups of citizens, for example schoolteachers, NGO employees, or discussion club volunteers. These hosts were able to organize several citizen consultations and contribute additional resources, such as helping recruit participants, arranging a more “complete” event with dinner or snacks, and framing the consultation within topics that were relevant and interesting to their networks

3.2 Cross-country comparability

The participation of approximately 100 citizens per country was a success and met the project’s goals. However, a sample of this size does not allow for statistically significant comparisons between countries. The results can therefore indicate broad tendencies, but they cannot reliably distinguish whether differences between countries reflect genuine variation in public attitudes with significance. Larger or more proportionally structured samples would be needed to assess cross-country differences with confidence.

3.3 Multi-actor grounding

The Room of Acceptance was reviewed in an early stage by experts in the field of agriculture, ethics, sociology, and biotechnology, ensuring that the relevant dimensions were represented in the Room of Acceptance, based on existing knowledge. Multi-actor input helped identify blind spots in both ex-ante and ex-post phases, making the model more robust and more reflective of real-world tensions. However, the multi-actor grounding also requires strong coordination and clear processes, as stakeholder groups and experts may not always agree on definitions, priorities, or assumptions. Further, as indicated in the RoA ex-post, further consultation with stakeholders post citizen consultation might have yielded additional insights.

4 Key Takeaways

4.1 Early engagement importance

One of the clearest lessons from the development of the approach described here is that societal dialogue works best when it begins early in the innovation process. If engagement only happens once breeding approaches or enabling technologies are already defined and moving toward implementation, the conditions of societal dialogue can become defensive and polarized, focused on justification rather than exploration. Early engagement, by contrast, creates space to surface concerns, values and trade-offs before pathways are locked in. It allows stakeholders and citizens to shape the framing of the problem, the criteria for success, and the governance expectations that

will later determine legitimacy. In this sense, early engagement does not simply measure acceptance, rather it helps build the conditions under which responsible breeding approaches can be developed within societally acceptable boundaries.

4.2 Methodological Insights

Scenarios must be neither too technical nor too abstract.

The scenarios used in the citizen engagement were designed based on interactions within the consortium, drawing on a wide spectrum of expertise. While this helped maintain plausibility and realism in the scenarios, graphic design, narration and storyboarding were essential in ensuring accessibility for the citizens. This was a particular priority, because the topics of breeding technology and biotechnology in agricultural practice is a very complicated and not necessarily very accessible topic for most people, and because the discussions also involved reviewing various technologies and policies, that would not be very well known to most participants.

Conditionality is essential to understand acceptance

Through the repeated multiple choice question battery in the citizen consultation, it was possible to see how values and opinions conditioned each other, and how they paired with each other. This illustrates that social acceptance can rarely be expressed with a yes or a no, but is contingent on conditions such as governance, distribution of benefits, transparency, and animal welfare outcomes. Through the citizen engagement, we succeeded in making these conditions visible and comparable in ex-post Room of Acceptance.

Digital tools are effective for cross-country studies.

EngageSuite allowed for identical processes to be run locally across eight countries, ensuring method consistency. Mixed physical/online facilitation increased participation quality without requiring centralized events. Digital tools reduced costs and enabled rapid data consolidation. This may also have increased the participants' trust in the process, partly because the local hosts could reinforce the relevance and familiarity of the setting. A notable limitation, however, is the reliance on hosts' digital literacy and a stable internet infrastructure locally.

4.3 Governance-Related Insights

The deliberative format of the citizen consultations helped participants articulate and compare competing values and priorities, and scenarios helped citizens recognize that no future path avoids trade-offs, which led to more realistic discussions. Trade-offs became visible in the stated preferences, for example environmental improvements vs. perceived "unnaturalness," or productivity gains vs. distribution of benefits.

The ex-post Room of Acceptance provides input on which breeding approaches are seen as acceptable under which societal conditions, and insights can be used by WP8 to align breeding strategies with societal expectations early in the innovation process.

5 Outlook: Reuse of the Model Beyond RUMIGEN

5.1 Guidance/motivation on How the Model Can Be Applied Elsewhere

Although the WP2 model has been developed and tested in the specific context of ruminant breeding, its core logic can be transferred to other areas of technology assessment. At its heart, the model offers a way to structure societal dialogue around conditional acceptance: it helps clarify which combinations of purposes, outcomes and safeguards keep a given approach “inside the room” for stakeholders and citizens, and when it moves outside. This logic can be adapted to other domains by re-specifying the dimensions, scenarios and actor constellations while retaining the same overall steps:

desk study → stakeholder co-construction of dimensions → scenario development → citizen testing and refinement.

In other livestock sectors (e.g. pigs, poultry, aquaculture), the basic steps of the model can be preserved, but the substance of the RoA dimensions and scenarios needs to be adapted to sector-specific concerns. For example, issues such as stocking density, housing systems, tail docking, beak trimming, or access to outdoor areas may become more prominent dimensions in pigs or poultry than in ruminants. Similarly, economic structures and disease challenges differ across species.

Applying the model in these contexts would involve:

- conducting a targeted literature and policy review on societal debates and regulatory frameworks in the specific sector,
- involving relevant stakeholders (farmers, integrators, veterinarians, NGOs, processors, retailers) in refining sector-specific RoA dimensions, and
- designing scenarios that reflect realistic futures for that sector (e.g. different trajectories for intensification, welfare standards, climate regulation, market organisation).

The main motivation for doing so is that breeding strategies in each livestock sector are closely entangled with sector-specific welfare debates, economic dependencies and regulatory trajectories. A sector-adapted RoA can therefore inform breeding choices and governance discussions in a way that is sensitive to these particularities, while still offering a comparable framework across livestock species. However, the fundamental framework can provide the same type of nuanced and informed insights that can provide the depth of insight that is useful in estimating future acceptance and shaping priorities in the research and development phases of new technologies.

The model can also be translated into plant breeding, where questions of societal acceptance have long been prominent, for example in debates on GM crops and gene editing. Many of the generic RoA dimensions remain relevant (e.g. environmental impact, corporate control, transparency, contribution to sustainability goals), but the concrete issues differ: pesticide use, herbicide tolerance, biodiversity effects, patenting, dependence on proprietary seed systems, and resilience to climate extremes come to the fore.

Beyond breeding, the RoA model offers a generalisable approach to societal dialogue on emerging technologies that raise complex ethical, environmental and social questions. This may include, for example, new reproductive technologies in animals or humans, synthetic biology applications, AI in critical decision-making, or climate engineering proposals.

In these domains, the benefits of adopting the RoA model are twofold:

- It moves the conversation beyond narrow risk assessments and binary “for/against” debates, towards a structured exploration of *conditions* for acceptability (e.g. purposes, governance, reversibility, distribution of benefits and burdens).
- It embeds societal dialogue early in the development process, allowing concerns and expectations to be taken into account before trajectories become locked-in.

In all these applications, the RoA model should not be seen as a ready-made template, but as a flexible framework. Its value lies in providing a clear sequence of steps and a common language for talking about conditional acceptance, while allowing the substantive content of the room, the dimensions, thresholds and scenarios, to be tailored to the specific technology, sector and socio-political context. Thus, it is a new approach to societal dialogue that is widely applicable, but context-sensitive.

5.2 Proposed next steps

To consolidate and extend the value of the WP2 model and the Room of Acceptance framework, a sequence of next steps is planned. These steps are justified by the need to both validate and refine the methodological contribution, translate findings into actionable guidance for decision makers, and secure an academic uptake of the method beyond RUMIGEN.

First, a conference presentation for the final policy conference will be prepared. This step will be taken to ensure that the integrated model is exposed to peer feedback from relevant communities. Through conference presentation, the conceptual framing of conditional acceptance and the practical lessons from multi-country implementation presented to stakeholders to add to and nuance current debates in technology assessment, responsible innovation, and participatory governance, specifically in animal breeding. The conference format is also well suited for presenting the model in a concise, practice-oriented form and for building awareness among audiences likely to reuse or adapt the approach.

Second, integration into policy briefs will be undertaken as part of the work in WP8. This will be done to increase the direct societal and institutional relevance of the work. This step supports the integration of model insights that are highly actionable for governance and innovation systems, particularly regarding the importance of early engagement, the identification of potentially non-compensatory concerns, and the role of transparency, oversight, and fairness in shaping legitimacy. Policy briefs can be used to translate these findings into clear recommendations for regulators, breeding organisations, and food system stakeholders who require concise and decision-relevant guidance rather than detailed methodological documentation.

Third, a full academic paper is under consideration to be developed to secure the model’s long-term contribution and transferability. This step provides a more comprehensive theoretical and methodological account than is possible in a deliverable or conference format. The academic paper can be used to elaborate the *ex-ante/ex-post* logic, clarify the method’s epistemic and normative assumptions, and present the Room of Acceptance as a generalizable framework for societal dialogue in other livestock sectors, plant breeding, and additional emerging technology domains. In this way, a stronger evidence base and conceptual foundation can be established for future reuse, replication, and methodological refinement.

Taken together, these steps should be viewed as a coherent pathway through which the RoA model can be disseminated. By moving from deliverable synthesis to scholarly exchange, policy application,

and academic consolidation, the method can be strengthened while its value for responsible innovation in breeding and beyond can be more effectively realised.

6 Conclusion

This deliverable has presented the WP2 model for societal dialogue on animal breeding developed in RUMIGEN and synthesized in Task 2.5. The model responds to a persistent challenge in agricultural innovation: breeding technologies evolve quickly, while societal expectations regarding animal welfare, environmental sustainability, transparency, and fairness are also shifting. In such a landscape, societal acceptance cannot credibly be treated as a binary verdict or a one-off measurement. Instead, it must be approached as a conditional and evolving space in which legitimacy depends on the purposes of breeding, the outcomes it produces, and the governance conditions under which it is developed and implemented. The central contribution of WP2 has been to operationalize this insight through the Room of Acceptance framework and to embed it within an integrated methodological flow. Beginning with a desk-based mapping of existing debates, moving through multi-actor validation of acceptance dimensions, and advancing toward an empirically refined ex-post Room of Acceptance, the model demonstrates how societal dialogue can be structured in a way that is both methodologically robust and practically usable. The ex-post RoA, in particular, consolidates earlier insights into a more usable set of dimensions and provides clearer signals about where societal boundaries appear firm and where trade-offs may remain open to negotiation. This strengthens the model's capacity to serve as a guidance tool, not only for interpretation of public perspectives but for shaping responsible innovation pathways. At the same time, the approach is not presented as a final or universally fixed template. The model's value lies in its transferability as a framework and a sequence of steps rather than in any one definitive list of dimensions. To remain credible across contexts, future applications will need to adapt dimensions, scenario logics and stakeholder constellations to the specific sector, species, or technology under consideration. The coordination demands of multi-actor processes, the challenges of cross-country comparability, and the limits of short deliberative formats should therefore be seen as design considerations rather than drawbacks that undermine the core approach.

The most important overarching lesson is that early engagement matters. When societal expectations and boundary conditions are explored before innovation pathways are locked in, the space for constructive alignment between technical possibilities and public values expands significantly. The WP2 model offers a structured way of enabling such early, iterative dialogue. Building on this foundation, the model is well positioned to inform future RUMIGEN activities and to be adapted beyond the project across other livestock sectors, plant breeding, and other emerging technologies where acceptance is shaped by complex value trade-offs. With further dissemination through a conference paper, policy briefs, and an academic publication, a strong argument can be made for embedding conditional, societally grounded acceptance mapping as a standard element of responsible research and innovation in breeding and beyond.

References

- Marques, M. D., Critchley, C. R., & Walshe, J. (2015). Attitudes to genetically modified food over time: How trust in organizations and the media cycle predict support. *Public Understanding of Science*, 24(5), 601–618. doi: 10.1177/0963662514542372

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, 42(9), 1568–1580. doi: 10.1016/j.respol.2013.05.008

UK Food Standards Agency. (2020). *Consumer Attitudes towards Emerging Technologies*. Retrieved from <https://www.food.gov.uk/research/behaviour-and-perception/consumer-attitudes-towards-emerging-technologies-0>

Wiek, A., Binder, C., & Scholz, R. W. (2006). Functions of scenarios in transition processes. *Futures*, 38(7), 740–766. doi: 10.1016/j.futures.2005.12.003