



# GEroNIMO project

*Genome and Epigenome eNabled  
breedIng in MOnogastrics*

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## Deliverable D5.1

### Interviews and focus groups feedbacks about the evaluation of genomics innovations

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## Abstract

*The GeroNIMO project aims at bringing sustainability and the breeding of farmed animals together through the means of genomic innovations. Work package 5 deals with the ethical and societal aspects of such breeding innovations, in particular genome editing. Although there is an ongoing debate about genome editing, it is mostly driven by expert and nonhuman animals play a minor role. There is also a lack of disciplinary diversity, and most arguments follow a consequentialist logic. This research tackled these factors by first conducting semi-structured interviews with experts affiliated with animal breeding, animal advocacy, and policy making (n=11). The interviews explore their perspectives on the public debate about genomic innovations, animal farming, and animal breeding in their respective countries. Subsequently, eight focus groups (n=70) were conducted in Germany, the Netherlands, France, and Slovenia. There were a rural and an urban group in each country and the sampling criteria included age, gender, educational level, and meat-eating behaviour. The topic guide covered the relationship between human and nonhuman animals, the future of farming, and genomic breeding innovations. Aside from investigating the public opinion on genomic innovations in farmed animals and the way it differs culturally and regionally, the focus groups themselves contribute to a societal dialogue on this topic. Furthermore, the topic guide is designed in a way that the relationship between human and nonhuman animals is critically reflected upon, and the interests of nonhuman animals are addressed. This way, we contributed to broadening the debate on the ethical implications of genome editing in farmed animals and simultaneously address the issues identified in the current debate.*

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## 1 Introduction

The GERONIMO project aims to address societal challenges such as human population growth, increasing environmental constraints, and changing socio-cultural values through animal breeding research. The aim is to contribute to a more sustainable breeding model that ensures production while promoting the efficient use of resources, animal health and welfare, and the conservation of genetic diversity. Recent advancements in omics technologies and genome editing technologies, such as CRISPR-Cas9, have provided opportunities to reconsider breeding by enabling more precise, efficient, flexible, and cheaper breeding compared to previous technologies. These advancements can also be applied to animal agriculture (FAO, 2022).

In addition to scientific challenges, genome editing technologies raise societal and ethical questions (Nuffield Council of Bioethics, 2022). The societal context is already embedded in the GERONIMO project as it aims to address societal challenges. In addition, it actively seeks to explore and study the potential societal and ethical dimensions. This report is part of Work Package 5, which aims to integrate social, natural, and ethical knowledge.

Research on the social and ethical dimensions of genome editing is relatively new, but this project can build upon previous work (e.g. de Graeff et al., 2019; Eriksson et al., 2018; Middelveld et al., 2022; Nuffield Council of Bioethics, 2022). This report is based on a review of the existing literature. From this, we have identified four weaknesses in the current approach to addressing the societal and ethical dimensions. First, the public is underrepresented, while experts take the lead in the discussion. Second, the perspective of nonhuman animals is insufficiently considered. Third, primarily veterinary or biomedical scientists are involved in the current debate, resulting in a lack of disciplinary diversity. Finally, there is a tendency towards consequentialist reasoning (de Graeff et al., 2019, pp. 9-10). In addition to improving these aspects, Kramer and Meijboom (2022) pose three scoping questions to broaden the ethical debate on genomic selection, which we believe are also applicable to genome editing. These questions relate to the inclusion of a broader philosophical vocabulary, the awareness that existing issues can be amplified by the emerging technology, and the importance of the broader social and technological context in which the technology is emerging.

The study that underlies this report aims to deal with the need to (a) broaden the debate to explore arguments beyond traditional ethics and (b) include the perspective of the general public. Therefore, we organized eight focus groups with the general public in four countries and performed eleven semi-structured interviews with professional stakeholders as part of the preparation. In this, we built upon previous research on the public perception of genome editing in farmed animals in the Netherlands (Middelveld et al., 2022). In addition, this part of GERONIMO starts from the hypothesis that further insight in and grip on the national concerns and discussions are essential to deal with the societal dimensions and for answering whether – if at all – genomics innovations can be responsibly introduced in pig and poultry breeding. As a proof of principle, we analyzed discussions in four countries (France, Germany, the Netherlands, and Slovenia) on (animal) breeding and technology and the future of agriculture.

While we acknowledge that the mere public endorsement of a certain practice or technology is insufficient for it to be morally acceptable, an exclusion of the public would definitely violate values of equality and fairness in a democratic society. Furthermore, we aim to contribute to public engagement in the debate on genome editing of farmed animals by conducting focus groups among members of the general public in these countries. This results in the following research question:

*Which societal and ethical issues related to genome editing in farmed animals are identified by members of the general public in France, Germany, the Netherlands, and Slovenia?*

Accordingly, the objectives of this study are as follows: (1) to research the public opinion on genome editing of farmed animals, (2) to investigate regional and cultural differences, (3) to contribute to a societal dialogue by conducting focus groups, (4) to enrich the dialogue by highlighting themes that are often neglected, and (5) to study empathic relations with nonhuman animals.

This report presents the design and method of the focus group discussions in four countries. This includes the results from the semi-structured interviews that were performed as a result of preparations of the focus groups and some preliminary findings. The analysis of national and regional dimensions for the societal and ethical concerns will be presented in Deliverable D5.2.

## 2 Background

### 2.1 *Ethics and empirical approaches*

Methodologically, we follow the approach of critical empirical ethics, which aims at an iterative process in which empirical and normative approaches constitute each other (Rehmann-Sutter et al., 2012). On the one hand, the empirical research and its instruments are informed by philosophical theorizing. The topic guide for the focus groups is based on the scoping questions provided by Kramer and Meijboom (2022), existing concepts in animal ethics, moral psychological and philosophical research on empathy, but also the empirical work done in the semi-structured interviews. On the other hand, the ethical decision-making process is informed by empirical data.

The empirical component of this research consists of semi-structured interviews and focus group discussions. Such methodology is vulnerable to the so-called is-ought fallacy (Rehman-Sutter et al., 2012), which refers to deriving a normative conclusion solely from descriptive facts. To avoid this fallacy, we critically discuss the narratives provided by participants in the discussion section of Deliverable 5.2 by relating them to existing ethical theories and arguments and highlighting the differences.

### 2.2 *Ethics and empathy*

The theoretical background of this study is influenced by the philosophical tradition of care ethics, which emphasizes the importance of emotions in ethical decision making. A special emphasis lies on concepts like sympathy or empathy as guides to moral decision making, especially in the field of animal ethics (Luke, 1995). The key assumption of the authors is that empathy makes oneself aware of potential moral costs of one's actions, which makes it essential for practical moral decision making. In line with that, care ethicists criticise traditionally competitive approaches and instead advocate cooperative deliberative processes in which participants assume good intentions and rationality of each other (Luke, 1995). The design of this research aims to both foster empathic relations with farmed animals and within the focus group. In line with this approach, this study draws on previous qualitative research on the public perception of genome editing in farmed animals by reoccurring narratives by the participants (Middelveld et al., 2022). Narratives can be defined as “stories to which we always return” and are “emotionally felt, without footnotes, without explanation or interpretation” (Heller, 2006, p.257). This corresponds with the idea of care ethics highlighting the importance of emotions in moral decision-making. Moreover, this approach is useful to classify and categorise arguments of the general public without any specific background in ethics or philosophy.

### 2.3 *Ethical Conduct of Research*

The Geosciences Ethics Review Board (SG ERB) of Utrecht University reviewed and approved this study on February 25<sup>th</sup> 2023 (reference: subject ERB Review DGK S-23894).

### 3 Semi-Structured Interviews

The goal of the small set of semi-structured interviews was to gain a better understanding of the public debates about genetic innovations, animal farming, and animal breeding in Germany, France, Slovenia, and the Netherlands. These interviews aimed to inform the project members about the necessity of modifying the topic guide for the subsequent focus groups in these four countries.

#### 3.1 Participants

Ultimately, 11 respondents were included in the semi-structured interviews. There were 2 German, 2 French, 3 Dutch, and 4 Slovenian respondents. The inclusion criteria were the same for each country: to have one person professionally related to animal breeding, one involved in animal protection, and one policy maker. We selected participants with the help of the network of the GeroNIMO consortium and the authors' personal network. In total, 23 participants were contacted via e-mail with some information on the project and an invitation to participate in the interview of which 12 agreed to take part. The participants were between 14 and 59 years old, with a median of 38, and there were 5 male and 6 female respondents.

In the Netherlands, all three interviewees fully met the inclusion criteria. In Germany, one of the participants had a background in both breeding and policy making, so they were interviewed for both perspectives. Given the results of the interviews combined with the existing knowledge in the work package on the German situation, it has been decided that the interview results were sufficient as input for the topic guide. In France, one of the policy makers resigned from participating because difficulties were indicated to talk on this topic from the perspective of a policy maker. Again, with the help of the consortium partners we were able to check whether we would have sufficient information to draft the topic guide. As a result, no extra interview was planned. In Slovenia, four participants were interviewed because the initial animal advocate interviewee turned out to be a researcher on animal welfare rather than someone who publicly speaks out for animal rights or protection, which is why we included this interviewee as well.

#### 3.2 Materials

The interview guide (Appendix A) consisted of three main topics, which were the perceptions of the national debates on genomic innovation, animal breeding and animal agriculture in general. For each topic, participants were asked to indicate the relevant themes in the public debate, share their thoughts on how these themes were discussed, and express what believed to be missing from the public debate in their respective country. In addition, respondents were asked to identify species-specific issues concerning animal husbandry and breeding. The start of the interview guide also included an extensive introductory section. Here, participants were asked to provide demographic information, as well as information about their daily routines, perceptions of their profession or animal advocacy, and how they follow the news. The aim of this section was to gain an insight into their demographics and routines as well as to make them feel comfortable with the interviewer. Finally, the questionnaire consisted of a round-up session in which the interviewee could provide the interviewer with media resources for following the public debate, and the interviewee was asked to raise any additional points that had not yet been discussed in the interview.

#### 3.3 Procedure

Participants were invited via e-mail to join the interview, received an information letter explaining the procedure of the interview including the fact that it will be recorded, and gave their written informed consent. After the consent was given, the participants were orally asked again to agree with starting the recording and they were given the opportunity to ask questions. Interviews with Dutch and German participants were conducted in the native language, while the interviews with French respondents took place in English. For the Slovenian interviews, two were conducted in Slovenian and the other two in English. The interviews with the Slovenian breeder, welfare researcher, and policy maker were performed by a representative of the Slovenian consortium partner. All other interviews were conducted by LB. The interviews took between 35 and 80 minutes.

#### 3.4 Data Analysis

The three Dutch interviews were conducted in person, while the other eight interviews took place online. Audio data from in-person interviews and screen recording data from online interviews were recorded. All 11

interviews were analyzed based on hand-taken notes by the interviewer. Subsequently, these notes were digitalized, complemented based on the audio recording, and coded based on recurring arguments. In order to anonymize the interviews, the participants were ascribed codes consisting of the sector (B for breeder, A for an animal advocate, and P for policymaker, W for Welfare researcher) and the country (DE for Germany, NL for Netherlands, F for France, and SI for Slovenia). Thus, the interview with a breeder from the Netherlands was coded as (B-NL) or the interview with an animal advocate from Slovenia was coded (A-SI).

### 3.5 *Preliminary Results*

The interviews revealed several commonalities across the four countries. In all countries, respondents indicated that there was little public debate about genetic technologies and animal breeding. However, some participants noted a polarised debate and a strong fear of genetic technologies, especially of GMOs, which they felt was unjustified. One participant also described a technology push by scientists promoting genetic technologies (B-NL). On a meta-level, the polarisation was also evident in the way participants evaluated the debate. One camp complained about the lack of knowledge about genetic technologies and that people were too afraid of GMOs (A-SI; P-NL; B-DE), while another group criticised scientists for presenting genetic technologies in too positive a light (A-NL; B-NL).

In all countries there is a debate about animal husbandry. Participants noted a strong focus on the housing of animals on farms and on individual incidents such as fires in stables. Interestingly, in line with the care ethics focus mentioned in the previous chapter, two participants highlighted the importance of empathy in the debate on animal farming, which they felt was lacking (A-NL; A-F).

There were also a number of country-specific issues. An issue specific for the Netherlands that came up in all three interviews was the public debate around the 'nitrogen crisis'. As the Netherlands exceeds the nitrogen limits set by the European Union, it is seeking to address this problem which includes the reduction of the number of farm animals. In response to the measures taken to achieve this goal, farmers in the Netherlands protested for instance by blocking the roads with tractors (B-NL; A-NL; P-NL). Concerning genetic technologies, two Dutch interviewees mentioned Herman the bull, who was the first transgenic bovine (B-NL; A-NL). In Slovenia, several participants mentioned that there was a debate about cloning (A-SI; B-SI; P-SI; W-SI) and that the debate was particularly polarised, with one participant stating that "it was almost like discussing Godzilla" (A-SI). At the time of the interviews in Germany, the culling of day-old chicks had been banned by the highest court. Therefore, this issue played a greater role in this country. Finally, France was the only country where food quality was strongly emphasised. One of the interviewees mentioned a label, the "label rouge", which indicates a high quality of food due to more traditional farming methods (B-F). A French participant also mentioned the importance of cultural identification with local breeds (A-F).

Based on these results, the guiding document for the focus group discussions has been modified in order to give room for participants to mention and discuss these country-specific themes, such as food quality, future of livestock, and views on the desirability of novel technologies in animal and food production.



## 4 Focus Groups

### 4.1 Design and Participants

After obtaining approval of the Geosciences Ethics Review Board (SG ERB) of Utrecht University (reference: subject ERB Review DGK S-23894), 8 focus groups were set up. In each of the four participating countries, there was one focus group among participants from an urban area and one from a rural area. We hypothesised that the level of rurality is relevant in so far as people from rural areas have more direct contact with animal farming and breeding. In France and the Netherlands, participants were recruited via professional recruitment agencies. In Germany and Slovenia, we used next to professional recruitment agencies also convenience sampling based on the wider network of local partners to obtain a sample fulfilling our criteria. Although we aimed for diversity within the focus groups, we also tried to avoid situations in which people felt alone with their opinion and run the risk that they would not dare to speak up. Hence, the aimed criteria for the composition of each focus group were the following ones.

- **gender** (at least 3 male & 3 female),
- **age** (at least 1 < 30; at least 1 between 30 and 60, at least 1 > 60),
- **educational level** (non-academic/academic; at least 3 per group), and
- **eating behaviour** (at least 2 vegans or alternatively vegetarians).
- **level of urbanity** (1 rural and 1 urban focus group per country)

In total, 70 people participated in the focus groups and the recruitment criteria were met in most of the groups (Table 1). Still, there were some differences between groups as the participants in Germany and Slovenia had a saliently different age distribution.

**Table 1.** Demographic Data

	GER R	GER U	SI R	SI U	F R	F U	NL R	NL U	Total
<b>Gender</b>									
Male	5	5	6	3	3	3	4	5	34
Female	2	3	5	8	5	5	6	2	36
<b>Age</b>									
<30	4	6	2	1	2	1	5	2	23
30-55	3	1	5	5	5	3	3	4	29
>55	0	1	4	5	1	4	2	1	18
<b>Education</b>									
Academic	5	6	5	8	5	3	5	3	40
Non-Academic	2	2	6	3	3	5	5	4	30
<b>Diet</b>									
Vegan	0	2	2	0	0	0	0	0	4
Vegetarian	2	0	0	2	1	0	1	4	10
Flexitarian	0	0	0	0	2	3	0	1	6
Omnivore	5	6	9	9	5	5	9	2	50

GER = Germany, SI = Slovenia, F = France, NL = Netherlands, R = Rural, U = Urban.

## 4.2 Materials & Procedure

The topic guide used for the focus group consisted of five sections, which were an introduction, the three main discussions about human-animal relations, the future of farming, and genetic innovations, and a round-up section to conclude the focus group discussion. The introduction session highlighted the principle of collaboration rather than competition by inviting the respondents to ask questions first to each other rather than immediately criticising the other in the case of disagreements and to see the process of a focus group discussion more as a collaboration than as a competition. Furthermore, the participants were asked to introduce themselves and name their favourite dish and favourite animal.

The first discussion session dealt with the relationships between human and nonhuman animals. Here participants were asked to indicate based on seven positions how they view domesticated animals. All these positions were based on existing societal or ethical perspectives.

*(1) Like a resource: They are merely a resource for us which we can use however we want.*

This position reflects the idea that nonhuman animals do not have any moral status. Philosophically, this position is attributed to Rene Descartes, who claimed that contrary to humans, nonhuman animals do not have a mind (Gruen, 2011, p.3). A more instrumental view of animals was seen in the Stoics, such as Chrysippus, who stated that all animals have a certain purpose for humans. He claimed that “bugs are useful for waking us up and mice for making us put our things away carefully. Cocks have come into being for a useful purpose too: they wake us up, catch scorpions, and arouse us to battle, but they must be eaten, so there won’t be more chicks than is useful. As for the pig, it is given a soul ... of salt, to keep it fresh for us to eat” (Sorabji, 1993, p.199).

*(2) Like a valuable property: We can kill and harm them for our interests, but we should minimize harm if feasible.*

The valuable property position is a reformulation of the so-called animal welfare position. As animal rights scholar Gary Francione (2010, p.24) puts it: “This position maintains that animal life has a lesser value than human life and, therefore, it is morally acceptable to use animals as human resources as long as we treat them ‘humanely’ and do not inflict ‘unnecessary’ suffering on them.” It is the foundation of the animal protection law of many states in the Western world. A similar position has been brought forth by philosopher Immanuel Kant for whom nonhuman animals did not have moral status as they lacked the capability to reason. However, Kant argued that humans should minimise harm towards other animals not for the animals’ sake but to prevent humans from habituating character traits that make them bad citizens. As he puts it: “if a man has his dog shot, because it can no longer earn a living for him, he is by no means in breach of any duty to the dog, since the latter is incapable of judgment, but he thereby damages the kindly and humane qualities in himself, which he ought to exercise in virtue of his duties to mankind” (Kant, 2001, p.212).

*(3) Like a part of nature: Animals deserve respect as they are part of our ecosystem. We should not commercialize and objectify them, but hunting or local agriculture are okay.*

In contrast to the previous position, here, the animals’ value is derived from them being part of a shared ecosystem. Most famously, Holmes Rolston III has argued in favour of an ecocentric approach for ethics, in which the value of whole ecosystems or group entities such as species outweighs individual interests. As he puts it in his essay “Treating Animals Naturally?”, “I eat animals and leave them to perish in the wild. I kill goats to save a few endangered plants. I tolerate hunting, under ecosystemic conditions. I accept some wildlife commerce as a management tool” (Rolston, 1989, p.131). Furthermore, Rolston (1989, p.133) emphasises the importance of a ‘natural’ treatment of animals, which entails some idea of proportionality, resulting in the following 4 principles that he endorses: “(1) The use should be natural, basic to animal and human ecology, continuous with the natural processes on which culture is superposed. (2) The use should not be above the baseline of pain that characterizes natural systems, but it may be continuous with it. (3) The use should not cause pointless pain. (4) The use should include appropriate respect for intrinsic, instrumental, and systemic values in nature. Such use will follow nature in relative, homeostatic, axiological, and tutorial senses.”

*(4) Like a trade-off: We can only harm or kill them if we have no other options to fulfil those needs and interests, which are comparable to the animal’s interests in life, integrity, and welfare (essential needs).*

A trade-off is central to utilitarian ethics consider an action to be good if it maximises pleasure and minimises pain. This position is resembling Peter Singer's utilitarianism, functioning under the principle of equal consideration, which entails that the interests of all sentient beings, no matter which race, species, gender, or sexuality, have to be considered equally (Singer, 2011, p.20). In practice, this means that one's interest for the taste of a certain product is outweighed by fundamental interests in not suffering or dying. However, the interests of millions of humans in a certain medicine, thus, in not suffering and dying, might outweigh the interests in a thousand of lab animals in not suffering and dying for animal testing if there is no alternative.

(5) **Like Workers:** *they have basic rights for life and physical integrity, but we can make use of their "manpower".*

The idea of animals as workers assumes that nonhuman animals possess the rights for life and physical integrity, but that instrumentalising them is morally acceptable as long as these fundamental rights are not harmed. These rights resemble Alasdair Cochrane's philosophy expressed in his book "Animal Rights without Liberation" (2012). He claims that nonhuman animals have a fundamental interest in not suffering and dying, but they do not have such an interest in liberty as they are not autonomous entities (Cochrane, 2012, pp.7-13). Furthermore, the specific idea of (farmed) animals as workers has been brought forth in the academic literature given that they actively or passively produce certain valuable commodities (Shaw, 2018).

(6) **Like Nonrational Humans:** *children, elderly with Alzheimer: respect for life, harming and instrumentalizing them is unjust, but we can and sometimes should limit their freedom if it benefits them.*

Similar to the previous position, this idea assumes basic rights for life and physical integrity without granting domesticated animals autonomy. However, the focus is more on a relation of care rather than utilising them as workers. In this case, the animal's autonomy is not restricted for the sake of benefitting from them, but to acknowledge their vulnerability and to ultimately benefitting the individual animal themselves. It is based on the care ethics approach formulated by Josephine Donovan and Carol Adams (2000, p.4), who state that aside from the relational dimension, "It is wrong to harm sentient creatures unless overriding good will result *for them*. It is wrong to kill such animals unless in immediate self-defense or in defense of those for whom one is personally responsible. Moreover, humans have a moral obligation to care for those animals who, for whatever reason, are unable to adequately care for themselves, in accordance with their needs and wishes [...]"

(7): **Like Autonomous Rational Beings:** *Animals know what is best to them. They have rights to freedom, life, and physical integrity. We should not interfere with their autonomy and limit human-animal interaction to a minimum.*

This position resembles the abolitionist approach, most famously argued for by Gary Francione (2012). The abolitionist position entails that nonhuman animals should not be regarded as human property and that all use of animals is morally wrong. This includes not only farmed animals, but all domesticated animals who are dependent on and vulnerable to humans, including companion animals. As Francione (2010, p.36) puts it, "The animal rights position does not mean releasing domesticated nonhumans to run wild in the street. If we took animals seriously and recognized our obligation not to treat them as things, we would stop producing and facilitating the production of domestic animals altogether. We would care for the ones whom we have here now, but we would stop breeding more for human consumption and we would leave non-domesticated animals alone."

Before the focus group discussion started, these seven positions were distributed in a circle in the room near the table where the discussion took place. During the discussion, people were asked to stand and position themselves in the position with which they most identified, explain their choice to the other participants and respond to each other. People were then asked to imagine an ideal world in 15 years' time, reposition themselves accordingly and engage in a conversation about their choices.

For the next question, the participants were presented a pig called Jonas, whose individualistic characteristics were highlighted, such as having escaped from a truck to a slaughterhouse, having a favourite dish, favourite activities, or being curious. Although lay people might identify this individual pig as anthropomorphised, he was only ascribed characteristics which pigs genuinely possess. After being introduced to Jonas, the participants were asked to re-evaluate their position. The intention behind Jonas was to stimulate empathy,

which we argued to be an important source for good moral decision-making. A literature review on empathy with nonhuman animals suggests that highlighting individuality and subjectivity are positively related with humans feeling empathy for nonhuman animals (Young et al., 2018, p.336). Furthermore, we aimed at accommodating for the lack of nonhuman animals' interests in the current debate about genome editing. Finally, the participants were asked to indicate how domesticated animals are seen in current animal agriculture based on the 7 positions. After the discussion about Jonas, the participants were asked to indicate the two most significant challenges in agriculture and to go back to the table in order to discuss the next topic, which was the future of farming.

The discussion about the future of farming started with the question of how animals should be regarded in the agricultural system of the future based on the seven positions, which we discussed previously. Subsequently, the respondents were asked to state the degree to which agriculture should involve technology on a scale from one to seven. The same question was asked about the scale, thus whether it should happen more locally or globally. After having indicated these criteria, the participants were presented three possible future scenarios of farming. They were asked to evaluate the scenarios, indicate how each of these scenarios represents animals based on the seven positions, and which scenario they prefer. All of these scenarios represented different human-animal relations, involvement of innovative technologies, and scale. The scenarios always included three of the following ones:

(1) **Backyard hens for egg:** *People keep backyard chickens individually or with small groups under highest welfare conditions and take care of them. They eat the eggs, but do not kill the chickens even if they do not lay eggs anymore.*

This scenario presents a local, small-scale idea of farming, in which animals do have rights not to be harmed and killed, but we can make use of their eggs, while taking good care of them. This scenario comes the closest to the idea of animals as workers or animals as nonrational humans when comparing it to the positions described above. A more thorough discussion of backyard hens and the underlying philosophical positions can be found in the academic literature (Fischer & Milburn, 2019).

(2) **Backyard chickens for meat:** *People keep backyard chickens individually or with small groups under highest welfare conditions and take care of them. They eat the eggs and kill the chickens even if they do not lay eggs anymore or if they reached a certain size. The chickens are decapitated as painlessly as possible.*

Like the previous scenario, this vision of farming is local and happening on a small scale, but the relationship between the human and the nonhuman animal is different as the chicken gets killed in this scenario. This vision is in line with Holmes Rolston's view of treating animals naturally and the welfarist idea of animals as valuable property.

(3) **Precision fermentation:** *"Fermentation is a centuries-old process that uses microbes, such as yeast or fungi, to break down a compound, such as sugar, and create a by-product, like alcohol – or, in this case, protein. Combining various fermentation techniques with modern technology is enabling biotech companies to create proteins that rival those in animal products" (Kateman, 2021).*

Precision fermentation is a scenario that is consciously chosen for its ambivalence. While fermentation is indeed a centuries-old practice, the combination with modern biotechnology makes it highly innovative. Precision fermentation is a technology that, in the long run, can be used on a small and large scale. Animals are not needed in this scenario anymore which most likely aligns it with the vision of animals as autonomous and rational beings.

(4) **Plant-based proteins:** *"[P]lant-based meat [...] is constructed from proteins extracted from plants with the appropriate structuring processes. [...] Considering the technical robustness and scalability for the production, as well as the long consumption history of traditional processed plant-based protein foods (such as tofu and tempeh) in Asia, plant-based meat has the potential to become a mainstream product among all commercial meat alternatives." (He et al., 2020, p.2640).*

Plant-based proteins can be produced in a traditional way like fermentation in the case of tofu and tempeh, but there are also innovative ways of producing plant-based meat. They can be produced on a large scale without involving any animals. Accordingly, it suits the vision of animals as autonomous and rational beings as well.

(5) **Precision-livestock-farming:** *"PLF applies sensors and information technology in livestock to recognise group behavioural patterns, identify individual animals, detect the occurrence of fertility, disease and discomfort, as well as to measure changes between individuals and groups of animals over time"* (Bos et al., 2018, p.78).

Precision-livestock-farming combines technological innovations with a large scale of animal farming. This scenario is in line with the welfarist vision of animals as valuable property as these technologies aim at enhancing welfare and reducing harm, while nonhuman animals are still seen as killable and usable.

(6) **Local farmers as producers of cultured meat:** *"The proposal aims at developing meat, but also milk and cheese and potentially many more animal products, in new biotechnological ways, not just on large industrial scales but also on smaller scales, for farmers and urban producers. It is [...] a future in which various biotechnologies are combined with keeping (much less) animals, with arable farming and with other old and new forms of food production"* (van der Weele, 2021, p.16).

This scenario is combining a small-scale farm with modern technologies. Animals are still used, but they are not necessarily severely harmed or killed – depending on how invasive the extraction of stem cells is. In an ideal future scenario, this vision represents the idea of animals as workers as one makes use of their labour without harming or killing them.

The final main topic concerned genetic innovations in animal breeding. First, the respondents were introduced to the technology of gene editing. Here we used the similar information as has been used by the study of Middelveld and colleagues (2022). Subsequently, they were asked to state what they know about gene editing technology and express their first impressions. After having a general discussion about this technology, the participants were presented four different breeding goals. Based on previous research, which identified human health, productivity, animal health, and improving animal welfare as a possible categorisation of breeding goals (Ishii, 2017, p.29), we conceived four different, but related categories, which were human purposes, animal welfare, environment, and transformation towards alternative proteins. The reason was that we regard the distinction between animal welfare and animal health as redundant since we claim that, in line with most approaches to animal welfare, health is an essential constituent of welfare. Furthermore, we aimed to broaden the discussion by including environmental purposes as well as a potential transition away from animal-based proteins. Under human-related goals, we listed allergen-free dairy and eggs, productivity, and meat quality. For animal welfare, we proposed robustness against circumstances such as heat or against diseases, but also the replacement of potentially harmful procedures such as dehorning by breeding hornless cows as breeding goals. Environmental breeding goals were a reduction of emissions and feed efficiency, while a breeding goal related to a transformation was the quality of stem cells for cultured meat. Per discussion, one breeding goal of each category was selected and the participants were asked to rank them in terms of desirability and to propose their own breeding goals.

Finally, the respondents were presented three visions of genome editing, which were in line with the study by Middelveld et al. (2022). The first scenario was a positive one, which identifies gene editing as a revolution improving meat quality, animal welfare, productivity, and sustainability, as it is frequently envisioned by companies or scientists (Ruan et al., 2017). Secondly, we presented a negative scenario as it is portrayed by NGOs, who state that editing animals leads to a further intensification of animal agriculture and diminishes the motivation to properly address animal welfare issues (Friends of the Earth, 2019). Thirdly, there was a pragmatic vision claiming that genome editing is a less ideal solution than the transition towards plant-based diets or a shift towards cultured meat, but more likely to lead to actual improvements in the short term (Shriver & McConnachie, 2018). The participants were asked to indicate any salient features and which scenario resonates the most with them.

The discussion was concluded by asking the respondents for feedback about the discussion and whether anything is missing. Subsequently, they were asked to state their take-home message and ask any remaining questions. After all questions have been answered, the participants were thanked for their participation.

### 4.3 Data Analysis Plan

All interviews will be transcribed via Amberscript and manually edited. Subsequently, the transcripts will be translated into English by the researchers and their associated partners. Once the English transcripts are ready,



they will be coded inductively with Atlas.ti. The codes will be reflected upon by both authors and recoded until agreement is reached. After coding the arguments, reoccurring argumentation patterns will be described and related to the existing literature. Finally, the arguments given in the focus groups will be analysed in terms of validity and soundness.

The results including the analysis of national and regional dimensions for the societal and ethical concerns will be presented in Deliverable D5.2.

## 5 Conclusion

This research aimed to investigate which societal and ethical issues related to in genome editing in farmed animals are identified by members of the general public in France, Germany, the Netherlands, and Slovenia. Previous research identified that the current debate lacks public representation, a proper acknowledgement of the perspective of nonhuman animals, disciplinary diversity, and a variety of arguments (de Graeff et al., 2019, pp.9-10). Through the means of expert interviews and focus groups with the general public, we actively addressed this lack of public representation, especially given the empirical approach to ethics that we adhere to in this study (Rehmann-Sutter et al., 2012). Furthermore, we enabled a proper acknowledgement of the perspective of nonhuman animals by starting the discussion broadly about a reflection on human-nonhuman animal relations, which included the individual experiences and character traits of a pig, who was not represented as an object, but as the individual subject, who he actually is. The disciplinary diversity is automatically addressed due to the sampling method of the focus group which aimed at the general public rather than experts who are already represented. Finally, the lack of variety in arguments was tackled more indirectly. The consequentialist way of reasoning as it is common in the natural sciences usually consists of a comparison between the status quo and the status quo with the addition of a certain technological innovation. By broadly discussing different future scenarios of agriculture, the participants were enabled to base their judgements on a broader range of options. Moreover, we assumed that the inclusion of a broader public than life scientists also leads to a higher variety in the arguments with which moral judgements are defended. The aim of addressing these issues was also reflected in our research goals which were (1) researching the public opinion on genome editing of farmed animals, (2) investigating regional and cultural differences, (3) contributing to a societal dialogue by conducting focus groups, (4) enriching the dialogue by highlighting themes that are often neglected, and (5) studying empathic relations with nonhuman animals.

This study faced several limitations. First, there were issues with the recruitment agencies whose candidates cancelled last-minute, which led to the researchers recruiting via convenience sampling methods in the wider network of the project partners. Second, given that all focus groups were conducted in the native language of the respective country, there is the risk in translating certain nuances. To provide an example, the English word “interests”, which is central to Peter Singer’s utilitarian ethics and the “Like a trade-off” position in the topic guide is slightly different from the German translation “Interesse”, which describes less crucial needs than its English counterpart. Simultaneously, having two focus groups in four different countries in the native language is a huge strength of this study as it allows for the inclusion of people who do not possess a sufficient knowledge of the English language. Moreover, this research is the first qualitative study about genome editing in farmed animals comparing different European countries. Finally, a strength of this research was that it did not only investigate cultural, international differences, but also regional differences in each country by conducting an urban focus group and one on the countryside.

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## 7 Annexes

### Appendix A: Questionnaire Semi-Structured Interviews

**Introduction: Thank you very much for joining this interview! Before we start, I would like to make sure that this is about your personal views and perception. There are no right or wrong answers. If you feel uncomfortable, you don't need to answer certain questions and you can stop this interview at any point as already stated in the informed consent document that you signed. Is that okay for you? Are there still any uncertainties?**

**Then, we will start with some demographic and warm-up questions.**

What is your age?

Which gender do you identify with?

What is the highest degree of education that you obtained?

What is your nationality?

In which country do you currently live?

On a scale from 1 (rural) to 10 (urban), do you rather come from a rural or an urban area?

What is your profession?

What motivated you to become a breeder/farmer/activist/policy maker?

What does your daily routine look like?

What do you like about your job/activism?

Are there aspects of your job/activism which you like less?

If yes, which ones?

What is the role of animals in your job/activism?

Via which media do you follow the news and public debates in your country?

How often do you follow the news and public debates in your country?

#### **The debate about genetic technologies in general**

Which topics concerning genetic technologies appear in the public discussion in your country?

What do you think about the way genetic technologies are discussed in your country?

Are there aspects missing in the public debate about genetic technologies that you would like to see more?

#### **The debate about animal farming**

Which topics concerning animal farming are publicly discussed in your country?

Which species-specific topics related to animal farming are discussed in your country?

What do you think about the way animal farming is discussed in your country?

Are there aspects missing in the public debate about animal farming that you would like to see more?

**The debate about animal breeding**

Which topics appear in the public discussion around animal breeding and technologies in your country?

Which species-specific topics related to animal breeding are discussed in your country?

What do you think about the way animal breeding is discussed in your country?

Are there aspects missing in the public debate about animal breeding that you would like to see more?

**Round-Up: Now, we came to the final section of this interview.**

We talked about a lot of different issues such as ... (mention what came up in the interview). Could you maybe provide me some links to online resources that I can follow the discussions in your country?

Are there any further important issues relevant for the public debate concerning genome editing in farm animals in your country that I forgot to ask about?

Is there anything on your side that you would want to talk about?

## Appendix B: Topic-Guide Focus Groups

1. *Welcome (15 minutes taking a seat, coffee/tea/snacks, 5 minutes introduction)*
  - *Empathy frame:*
    - *Cooperation instead of competition: About finding a solution rather than defeating the other*
    - *Asking questions first instead of refuting arguments immediately*
  - *Who are you?*
    - *What is your favourite animal?*
    - *What is your favourite dish?*
2. *The Here and Now (30 minutes)*
  - *How do you see animals? We prepared 7 positions in a circle (board 1; print & cut them, place them on the ground beforehand; maybe provide A4 prints for each position for better readability?). Where would you place yourself?*
  - *Imagine an ideal future in 15 years. How should we look at animals in such a future?*
  - *In ethics, it is usual to do a stakeholder analysis. We as humans, who eat, are relevant stakeholders in discussions about agriculture. At this point, I want to introduce Jonas, another stakeholder (board 2).*
    - *After seeing Jonas, do you re-evaluate your assessment of animals?*
  - *How do you see the role of animals in current animal farming? (indicate)*
  - *What are the (two) biggest challenges for the current food production system?*
3. *Food Production in the Future (40 minutes)*
  - *In an ideal future, how would food be produced?*
    - *Animal Involvement*
      - *See positions above*
    - *To what degree should technology be used (on a scale from 1-7)?*
      - *Labour-based/Innovation-based?*
    - *Should it be local or international (on a scale from 1-7)?*
      - *Small-Scale/Large Scale*
    - *What do you think of the following ways of producing food? (boards 3 & 4; pick 3 scenarios, otherwise it will take too much time. For each scenario discuss the two questions (“which do you desire?” & “how does this model think about animals?” apart)*
      - *Backyard chickens (eggs)*
      - *Backyard chickens (meat)*
      - *Precision Fermentation*
      - *Plant-Based Proteins*
      - *Innovative Intensive Precision Animal Agriculture*
      - *Farmers as Producers of Cultured Meat*
    - *Which do you desire?*
    - *How do you think each of these models think about animals based on the 7 positions we discussed earlier?*
4. *Gene Editing and Applications (30 minutes)*
  - *What is gene editing?*

- If you looked up a definition in an encyclopaedia it might say something like this (board 5)
  - Board on what is gene editing, what it is, how it works
  - Have people heard about such developments? Where? What have they heard?
    - Have they discussed them? With whom? Why?
  - What do you think about achieving these breeding goals? (Rank these goals; for each group, write down one goal on a post-it)
    - Human Purposes
      - Non-allergenic dairy/eggs
      - Meat Quality
      - Productivity
    - Animal Welfare
      - Disease Resistance
      - Circumstance Resistance (e.g. heat)
      - Welfare through making painful procedures unnecessary (dehorning, castration, etc.)
    - Environmental Purposes
      - Feed Efficiency
      - Sustainability (reduce emissions)
    - Transformation
      - Stem cell Quality for Cultured Meat
    - Do you know any other breeding goal that might be relevant? (let participants write down breeding goals on an additional post-it)
  - And here is how three different kinds of actors are thinking about it (show and display each on Board 6)
    - Positive vision: enabler of sustainable intensification, better welfare (hornless cows), disease resistant animals, environmental benefits—using arguments of scientists and breeding companies
    - Negative vision: a new wave of research on genetically engineered animals is leading us in the opposite direction to sustainable and ecological farming system — by designing animals to better fit within industrial systems rather than addressing the underlying health, animal welfare and environmental problems associated with these systems: Are they necessary, ethical and welfare concerns, unforeseen effects using arguments from NGOs and civil society organisations (including FOE report)
    - Non-Ideal Vision: Plant-based diets and cultured meat are morally preferable but unrealistic. Genome editing can bring welfare (and sustainability) improvements in the middle term.
  - Do you have any questions you'd want to ask about these things?
  - Does anything surprise you? Concern you?
  - Which (if any) do you feel an affinity with? Why? Why not?
5. Conclusion (10 minutes evaluation, 10 minutes leaving the space)
- What did you think of the discussion?
    - Was there anything missing?
  - What is your take-home message?
  - Thank you very much for your participation! Do you have any questions?