



FARMED FEEDER RODENT WELFARE

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CONSIDERED

Research Report:

Animal Welfare – Farmed feeder rodent welfare

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Executive summary

A significant number of people have exotic animals, including reptiles such as snakes and lizards, as pets. These pets are often carnivorous and primarily depend on rodents, especially mice and rats, as their primary food source. As a result, there is a global farmed rodent industry, with likely tens to hundreds of millions of rodents bred, farmed and killed each year to be used as pet feed.

Although there is limited evidence in the area, we think that there is good reason to believe that the welfare conditions that these rodents live in is likely quite poor. In a number of countries, it also appears that farmed rodents, especially those used for feed (rather than those used in scientific experiments or kept as pets), are not included within existing animal welfare laws and policies.

There are several potential avenues that look promising to improve the welfare of farmed rodents, and we anticipate that a combination of work with rodent farmers, as well as advocacy to government to ensure that rodent farming is included within existing farmed animal welfare policies and legislation, is likely to be the most effective.

Our geographic assessment had moderate to high degrees of uncertainty, but presented a few countries as potentially high priority for work in this area; in order of priority- USA, Germany, UK and Indonesia.

Modelling the cost-effectiveness of this intervention in the USA, although acting with limited available evidence and a number of estimated inputs, it seems like this intervention could be fairly cost-effective, and comparative to other high impact effective animal advocacy interventions.

In the implementation of this organisation, we anticipate that the primary difficulty will be the poor access to information. For instance, it is unclear what conditions feeder rodents are currently farmed in, and where, outside of the US, these rodents are farmed. However, we think that these uncertainties could be quickly resolved in 3-6 months by an organisation working on this intervention on the ground.

Overall, and in comparison to the other interventions considered in this cause area, we think that this is not an idea worth recommending to future charity founders due to the remaining uncertainties in the space.

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1 Introduction

This report has been produced by Charity Entrepreneurship (CE). CE's mission is to cause more effective charities to exist in the world by connecting talented individuals with high-impact intervention opportunities. We achieve this goal through an extensive research process and our Incubation Program. In 2022, our research process focused on the top interventions within animal welfare.

Farmed feeder rodent welfare was chosen by CE research staff as a potentially promising intervention within this category. This decision was part of an eight-month process designed to identify interventions that were most likely to be high-impact avenues for future charity entrepreneurs. This process began by listing nearly 275 ideas and gradually narrowing them down, examining them in more and more depth.

In order to assess how promising interventions would be for future charity entrepreneurs, we use a variety of different decision tools such as group consensus decision-making, weighted factor models, cost-effectiveness analyses, quality of evidence assessments, case study analyses, and expert interviews.

This process was exploratory and rigorous, but not comprehensive – we did not research all 275 ideas in depth. As such, our decision not to take forward a charity idea to the point of writing a full report should not be seen as a view that the idea is not good.

2 Background

Rodents, including rats, mice, squirrels, beavers and hamsters, are the single largest group of mammals. Rodents have been used (and exploited) for human consumption in many different ways- they have been consumed for food, used for clothing, animal testing and kept as pets. However, there is moderate evidence that perhaps one of the largest reasons for the breeding and farming of rodents is for use as feed for other exotic pets.

A significant number of people keep exotic animals, including reptiles such as snakes and lizards, as pets. For instance, in the UK, there were approximately 400,000 snakes owned as pets in 2021 ([Pet Food Manufacturers Association, 2021](#)), and there are an estimated 1.15M snakes owned as pets in the USA in 2012 ([American Veterinary Medical Association, 2012](#)). These exotic pets are often carnivorous, and primarily depend on rodents, especially mice and rats, as their primary food source. Snakes consume approximately 15.6 to 57 live or frozen rodents each year ([Šimčíkas, 2019](#)). As a result, there is a global farmed rodent industry, with tens to hundreds of millions of rodents killed each year purely to be used as pet feed.

Although the evidence in this space is limited, it seems very likely that a significant amount of the output of factory farming of rodents is for pet feed. Although some factory farmed rodents are used for other purposes e.g. for human consumption, kept as pets, bred at zoos and wildlife rehabilitation centres and used for scientific experiments, these likely represent a smaller population and are likely to have better welfare conditions due to greater public, scientific and government support ([Hobson, 2021](#)). By contrast, it seems very likely that the conditions of farmed feeder rodents is not only quite poor, but is also not regulated under existing animal welfare and farmed animal welfare policies and legislation.

Therefore, this intervention would seek to improve the welfare conditions of farmed feeder rodents.

3 Quality of evidence

We conducted a quality of evidence assessment across three areas:

1. The current welfare conditions of farmed feeder rodents
2. The current regulations and policies concerning the welfare requirements for farmed rodents
3. Evidence of tractability

3.1 Welfare conditions of farmed feeder rodents

Overall conclusions

- There is very little information about the conditions of farmed rodents, especially of large-scale facilities and those specifically for feeder rodents.
- It seems that the conditions that rodents are farmed under are largely unregulated.
- Overall, based on the available evidence, we think that it is moderately to highly likely that the conditions for farmed rodents are fairly poor. However, it seems unlikely but not completely implausible that there are some farms that have reasonably good welfare standards.
- An organisation working in this space would need to spend some time working with farmers to understand the current state and landscape of conditions.

Optimal welfare conditions

There are a few guidelines that focus on the welfare conditions that mice should be kept in, most of which are either for laboratory mice ([Fawcett, 2012](#); [Animals in Science Regulation Unit, 2014](#); [National Research Council \(US\) Committee for the Update of the Guide for the Care and Use of Laboratory Animals, 2011](#)) or for mice kept as pets ([RSPCA, n.d.](#)).

Some of the key welfare considerations are:

- **Housing:** ensuring rodents have plenty of space, nesting material, bedding material (to absorb moisture from excrement), shelters and that their housing is clean and dry
- **Environment**
 - Quiet: keep the cage away from high pitched sounds and sudden bursts of noise as mice are very sensitive to this
 - Temperature and humidity: mice are very sensitive to heat
 - Daylight: Mice benefit from some sunlight, but not excessive exposure to heat
- **Environmental enrichment:** things to occupy mice and keep them happy
- **Access to veterinary care**

Evidence that current rodent farming practices have sub-optimal welfare conditions

Rodents used for scientific conditions seem to be bred separately and their farming conditions seem to be quite regulated ([Animals in Science Regulation Unit, 2014;](#)) and adequate ([Pritchett-Corning et al., 2009](#)).

In contrast, the evidence for feeder rodent factory farming practices is very weak; there are few high quality or large scale investigations, with the majority of information from small undercover investigators undertaken by organisations such as PETA. A summary of the evidence is provided below:

- PETA did an undercover report into Holmes Farm, a massive animal dealer in Pennsylvania that supplies rodents to stores such as PetSmart, Petco and Pet Supplies Plus in the USA. Their undercover investigation found hundreds of violations of federal law. During nearly three months at one facility, PETA's observer saw many small animals dead and they were often housed in bins where no water was available. They also discovered that the conditions of feeder rodents, compared to rodents that were being sold as pets, were particularly poor. They describe live mice and rats being stuffed in plastic zipper bags and put in a freezer, slowly freezing to death as some frantically tried to claw their way out ([PETA, n.d.](#)).
- A report from Rethink Priorities identified several videos and photos of small-scale feeder rodent farms ([Šimčikas, 2019](#)). These videos and photos show high stocking densities, inadequate cleaning of containers from faeces, and a lack of daylight. Moreover, as a result of this high density, there is a lack of shelters and a lack of environmental enrichment.
- Indirect evidence: In the absence of significant direct evidence on the welfare of rodent farming, we think that it is likely that the conditions are similar to that of other factory farmed animals. Given that the conditions that rodents are farmed under is not regulated in the way that other farmed animals are in several countries, it seems likely that their welfare conditions are likely to be quite poor.

Evidence that current rodent farming practices have optimal welfare conditions

There is very limited evidence suggesting that the welfare conditions for farmed feeder rodents is not inadequate. A summary of the evidence is provided below:

- Within the US, there seems to be predominantly local production of feeder rodents, which claim to uphold good welfare standards. For example, one company, Perfect Prey, states “Every animal we sell is born and raised at our facility. We guarantee that they were raised in a healthy environment, were fed a proper diet and were humanely euthanized. Our animals are housed on shredded aspen bedding and cleaned weekly. They have access to purified drinking water and fresh air at all times. We have animal care staff present 7 days a week/365 days a year.” (perfectprey.com, n.d.) However, we note that as these are companies trying to sell their products there is significant risk of bias in this information.
- When contacting the suppliers or farmers of feeder rodents (very high risk of bias) and talking to pet snake owners (high risk of bias), there seems to be a general perception that the welfare of feeder rodents is reasonable.
- There are several profiles of farmed feeder rodent farms that seem to have reasonable welfare conditions. For example, one local farm in Queensland, Australia, mentions that the mice and rats have air conditioned facilities and a low stress environment. They also follow RSPCA guidelines for humane slaughter (Nmoffat, 2016). Also, one [YouTube video](#) of a small scale mouse breeding shows reasonable consideration for housing, feeding, watering and slaughter.

3.2 Current regulation and policies for farmed feeder rodent welfare

For those countries that do have regulations and policies for animal and farmed animal welfare, it seems that rodents, including mice and rats, especially those bred for feed, are not governed by these laws. Further details by country are provided below:

- USA: Unlike other rodents, rats and mice are not governed by the Animal Welfare Act (USDA 2013) and thus are not subject to federal regulations on caging, transportation and handling ([Hardin, 2017](#)).
- UK: Farmed rodents do not appear in the The Welfare of Farmed Animals (England) Regulations 2007 (legislation.gov.uk, 2007)
- On brief inspection of animal welfare policies and legislation in Germany and Indonesia, we can see the same exclusion of rodents from animal welfare laws in these countries too ([World Animal Protection, 2020a](#); [World Animal Protection, 2020b](#)).

3.3 Evidence of tractability

Overall, there is not clear strong direct evidence that points to the potential tractability of this intervention, and we do not have any examples of organisations working directly with farmers or on policy change for feeder rodent welfare.

However, we think there are a number of weak theoretic arguments that suggest that this intervention might be tractable:

1. Some feeder rodent suppliers, from their websites, seem to pride and market themselves based on the quality of the rodents that they supply (perfectprey.com, n.d.), and snake forums suggest that snake owners do care about the quality of the rodents that they feed their pet reptiles (ReptileForums.co.uk, 2010; Our Reptile Forum, 2022). This implies that they might be motivated to improve the welfare of feeder rodents.
2. A number of countries have regulations for rodents and other animals used in scientific research (Vasbinder and Locke, 2016). This implies a degree of acknowledgement and awareness of the sentience and welfare needs of rodents, and may mean that a harmonisation on welfare conditions of rodents in different settings is a tractable ask.
3. Use of rodents for research and testing for commercial purposes (e.g. for cosmetics) also has reasonably strong public awareness and negative perception (Understanding Animal Research, n.d.).
4. There is precedent on regulating the conditions of feeder rodents – although governments have previously only intervened for biosecurity reasons, for example following a Salmonella outbreak from feeder rodents used for reptile food originating from a premises in Lithuania (Food Standards Agency, 2022), this suggests that governments are able to and perhaps could be persuaded to regulate the conditions of feeder rodents for welfare reasons.
5. The countries with a high number of pet snakes and other reptile owners (e.g. the USA, the UK, and several European nations) tend to have higher animal welfare standards on average, which could make this a more tractable intervention in these countries given their general care for animal welfare.

4 Intervention approaches

This section of the report will discuss whether this intervention should focus on improving the welfare of rodents or regulating the sale of exotic pets, the concrete ways to improve the welfare of rodents, and a potential theory of change for this organisation.

4.1 Should the intervention focus on rodents or exotic pets?

There are several different approaches that one could take to improve the welfare of farmed feeder rodents, some of which are mentioned in Rethink Priorities' report on the topic ([Šimčikas, 2019](#)). Broadly, they fall into two categories:

1. Improve the welfare of rodents that are factory farmed
2. Make it harder/ban people owning pet snakes

Rodent focused interventions

- **Work with farmers to improve welfare standards for feeder rodents:** This is likely to be promising in a country where there is a high rate of local production of feeder rodents, and in which public and policy action on animal welfare has a great precedent. It is also more likely to be promising if farmers are open to improving their farming practices.
- **Policy advocacy to ensure that rodent farming is included in animal welfare laws:** This is likely to be most promising in a country that has some animal welfare and farmed animal welfare policies and/or has some regulations regarding the use of rodents in scientific experiments.
- **Certification scheme for the farming of feeder rodents:** This is likely to be promising if reptile owners know and care about the welfare standards that feeder rodents are farmed under. There do seem to be a few certification schemes for pet feed (eg. [the Pet Food Manufacturers Association's certification scheme](#) and [several others](#)), but none for live animals used as feed, and there is no concrete evidence of their cost-effectiveness. However, in assessing the broader usefulness of certification schemes for animal welfare across other farmed animals, there may be some precedent (albiet with unclear success at this time) that could justify the tractability and merit of this approach.
- **Ban import of low welfare feeder rodents:** This is likely to be most promising in a country where there is a high rate of import of feeder rodents. Overall, we expect this to be quite difficult as we would likely have to defend this ban under the public morals exemption of GATT Article XX ([World Trade Organization, 2012](#)), and it is unclear whether this is clearly an issue that the general public cares about and we currently do not have enough evidence of their welfare status. However, perhaps a new organization working in the space could generate this support and answer these remaining uncertainties.

- **Corporate campaigns, most likely to feeder rodent suppliers, pet stores, zoos or wildlife rehabilitation centres to improve and regulate the conditions of feeder rodents:** This is likely to be promising if there is public awareness and concern over welfare conditions of feeder rodents. This awareness and concern will have to be generated by a new organization working in the space.
- **Raise awareness of the conditions of feeder rodents both to the public and to reptile owners**

Snake focused interventions

Note that an intervention focused on snakes will likely require different tactics and levers, and have a slightly different theory of change. It seems that most of the discussion about regulating the ownership of snakes relates to the welfare of snakes, human safety, threats of snakes escaping and becoming invasive, and conservationist concerns about snakes being taken from the wild. It seems unlikely that feeder rodent welfare would likely be a strong or compelling argument for snake-focused interventions.

However, we have considered the following potential interventions, many of which were brought to our attention in Rethink Priorities report ([Šimčikas, 2019](#)):

- **Make it harder to own a snake**
 - Advocate for snakes to be added to the list of animals that are considered wild, dangerous or exotic. In the UK, if you want one of these animals, you need a licence ([gov.uk, n.d.](#)).
 - Advocate for snakes to be added to a positive list. A positive list is a list of animals that are allowed to be kept as pets based on strict criteria. If an animal is not on the list, it is illegal to keep or trade that animal. Several countries, including Belgium and the Netherlands have already adopted positive lists ([AAP Rescue Centre for Exotic Animals and Eurogroup for Animals, 2015](#)). We could advocate for snakes to be on this list, but this might be a hard ask given that there are a number of other more exotic pets that are not on this list.
- **Ban the keeping of snakes as pets:** For example, pet snakes are illegal in Iceland to prevent diseases ([Chandar, 2017](#)), and some species of snakes are banned in the U.S ([Allen, 2015](#)).
- **Reduce motivation and opportunity to own pet snakes:** For example, you could lobby to ban selling snakes in pet stores, or lobby to ban displaying snakes in pet store windows.

Overall evaluation

To compare the relative priority of working on the rodent- or snake-focused interventions, we considered three variables: tractability, scale and extent of impact and scalability.

- Tractability
 - **Pet snake owner:** It is likely to be more tractable and encounter less resistance from snake owners to convince them to buy higher welfare feeder rodents than to regulate or ban owning snakes. However, it is also possible that pet snake owners either do not care about the welfare of feeder rodents, do not think it is an issue, or would be very unlikely to pay additional money for higher welfare feeder rodents (it seems somewhat likely that welfare improvements may incur some additional costs for farmers that are passed onto consumers). Further information on the perception of pet snake owners can be found in the [Expert Views](#) section of this report.
 - **Governments:** We think that it may be tractable to advocate for improvement and/or harmonisation of animal welfare and farmed animal welfare policy to include feeder rodents. As well as this, there are biosecurity reasons for why governments may want to improve the welfare and reduce disease rates of feeder rodents, for example see the Salmonella outbreak in the UK ([Food Standards Agency, 2022](#)). However, given that there is a precedent of the sale of pet snakes being banned or regulated in some countries, this approach may also be tractable.
 - **Farmers:** We think that we are likely to encounter some resistance from feeder rodent farmers to improving welfare conditions. However, it may also be the case that, similar to the experience of other effective animal advocacy organisations, that there are some farmers who are interested and who lack the capability and motivation to improve welfare, which this organisation could support.
- **Scale and extent of impact:**
 - **Scale of impact:** Improving the welfare of feeder rodents means that rodents farmed for snake food, as well as for other purposes (e.g. pets) are improved. On the other hand, regulating or banning snake ownership, although it may not affect all feeder rodents, would likely affect a significant proportion, and would also improve the welfare of those snakes who would now not be bred as pets. It would also affect other live feed for snakes e.g. young chicks.

- **Extent of impact:** Regulating or banning pet snake ownership would likely result in reduced breeding of feeder rodents. If we consider this to mean that they have a net zero welfare from not being farmed, this is a greater impact than improving their welfare but not affecting net demand.
- **Scalability:** Both interventions seem to have similar paths to scalability, either in making feeder rodent welfare commitments at a government level or in other geographies, or in asking for bans on snakes as pets in more countries.

Conclusion: Although it is unclear which option is likely to be more appealing, and this question would likely benefit from further research, we anticipate that rodent-focused interventions are higher priority, and so have focused on these for the remainder of this report. [Based on a quick prioritisation exercise](#), we think that policy advocacy to ensure that rodent farming is included in animal welfare laws, alongside work with farmers to improve welfare standards for feeder rodents on their farms are likely to be the most impactful approaches when working to improve the welfare of these rodents.

4.2 How can we improve the welfare of rodents?

Although it is unclear what current welfare conditions rodents are farmed in, and therefore what their main welfare concerns are, there are some obvious improvements that may be of benefit:

1. **Nesting:** There is a good amount of evidence that providing rodents with nesting material improves welfare by allowing for better temperature regulation ([Brochu et al., 2018](#); [Gaskill et al., 2013](#)), decreasing stress, offering environmental enrichment and allowing mice to follow preferred behaviours e.g. being able to be separated from their own urine/faeces ([National Centre for the Replacement Refinement & Reduction of Animals in Research, 2021](#)). It is uncertain whether current farmers use nesting material for their rodents, although many photos and videos suggest that some farms do not.
2. **Enriched cages:** Environmental enrichment beyond nesting which includes other factors such as bedding, shelter and segregated areas, has been shown to improve welfare ([Bailoo et al., 2018](#)).
3. **Stocking density:** High stocking densities can negatively affect the welfare of rodents, especially by making rodents territorial and aggressive ([Theil et al., 2020](#)). We may choose to reduce stocking densities on farms.

4. **Temperature and humidity regulation:** Rodents prefer specifically regulated temperature and humidity ([National Centre for the Replacement Refinement & Reduction of Animals in Research, 2021](#)). Temperature and humidity regulation seems relatively easy to achieve through choice of cage/housing for rodents, as well as fairly easy and cost-effective to regulate for a building.
5. **Humane slaughter:** The slaughter methods of feeder rodents seem to be extremely poor, with evidence that rodents may be starved or frozen alive. This constitutes a protracted and extremely unpleasant experience. Given that a number of feeder rodents are under 30 days at death, protracted deaths for many hours (if mice are frozen alive or left to starve) represent a significant proportion of their lives. Improving slaughter to make it more humane (i.e. quick and painless) may be an effective welfare improvement ([RSPCA, 2011](#)).

5 Geographic assessment

Our geographic assessment aimed to help determine which country it might be the highest priority to focus this intervention in. In this assessment, we considered four main factors:

Factor	How it influenced our decision making
How many snakes are there ¹ ?	The greater the number of snakes, the higher priority an area is
How many feeder rodents are bred locally?	The more that are bred locally, the easier it might be to regulate their welfare
What are the current welfare conditions and regulations for feeder rodents?	If there is a lot of current regulation and it is being complied with, this country may be less appealing as less marginal benefit
How good are that country's animal welfare standards more broadly?	Countries with good animal welfare standards more broadly are likely to be more tractable

¹ Although there are several other reptiles that are fed feeder rodents, there is moderate evidence, from looking at websites where feeder rodents are sold, that a significant proportion of feeder rodents are consumed by pet snakes.

5.1 How many snakes are there?

Although there was some data on the number of pet snakes by country, this data has unclear sources, and was not comprehensive for all countries.

Within the UK, according to the UK's Pet Food Manufacturers' Association's (PFMA) annual surveys, there were 200,000–400,000 snakes owned from 2012–2021:

2012	200,000 (Pet Food Manufacturers Association, 2012)
2013	300,000 (Pet Food Manufacturers Association, 2013)
2014	400,000 (Pet Food Manufacturers Association, 2014)
2015	300,000 (Pet Food Manufacturers Association, 2015)
2016	300,000 (Pet Food Manufacturers Association, 2016)
2017	N/A
2018	200,000 (Pet Food Manufacturers Association, 2018)
2019	200,000 (Pet Food Manufacturers Association, 2019)
2020	N/A
2021	400,000 (Pet Food Manufacturers Association, 2021)

In the USA, the most recent data we could find is from 2012. The American Veterinary Medical Association reports that 550,000 households own a snake and that there are a total of 1.15M pet snakes ([American Veterinary Medical Association, 2012](#)).

For other countries, we couldn't find any data, or the only data available is for pet reptiles more broadly. For example, the two major sources of European data show that Germany, France, the UK, Spain, Italy and Russia have the highest number of reptile owners. This is followed by Netherlands, Switzerland, Turkey, and Poland ([The European Pet Food Industry, 2020](#); [Bedford, 2021](#)).

Our expert interviews highlighted that there could be a significant number of rodents farmed in Japan, Italy, France, Spain, and Russia. However, with limited data to back this up we decided to focus only on the countries where we could find concrete data on the number of snakes or rodents farmed.

Combining these data sources, the four countries with the greatest number of pet snakes and therefore likely the greatest consumption of farmed feeder rodents were:

- United States
- United Kingdom
- Indonesia
- Germany

The subsequent assessment will focus on these four countries.

5.2 How many feeder rodents are bred locally?

If a significant proportion of feeder rodents are locally farmed, it will be easier to regulate welfare standards for farming than if they are imported from overseas. If they are imported from overseas, it might be the case that this idea falls as a sub-idea under the ‘ban the import of low welfare goods’ intervention, or we could advocate for welfare improvements in those exporting countries.

UK

UK sources of feeder mice and suppliers		
Source	Supplier	Local production?
Reptile Centre	Peregrine Live Foods	Likely not produced in the UK. Not produced in Lithuania. ²
Evolution Reptiles	Peregrine Live Foods	Likely not produced in the UK. Not produced in Lithuania.
Online Reptile Shop - By far the most popular on Amazon UK	Peregrine Live Foods	Likely not produced in the UK. Not produced in Lithuania.
SwellReptiles	Not clear	Not clear

² When Peregrine Live Foods were contacted via phone, they were unwilling to say where they sourced their feeder mice from but implied that it was not from within the UK, but they also stated that they did not source from Lithuania (this is relevant given the Salmonella outbreak from Lithuanian supplies ([Food Standards Agency, 2022](#))).

Buzzard Reptile	Monkfield Nutrition	<p>Not produced in the UK – “Supplied directly from our rodent farm in Europe”.</p> <p>At least some production in Lithuania as Monkfield was specifically mentioned in the FSA’s advice following a Salmonella outbreak from feeder rodents used for reptile food originating from a premises in Lithuania (Food Standards Agency, 2022)</p>
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USA

USA sources of feeder mice and suppliers		
Source	Supplier	Local production? ³
Feeder Source	Not clear	Not clear
Underground Reptiles	Not clear	Yes – “Bred locally in the same rodent farm for the last 20 years”
Big Cheese Rodent	Not clear	Yes – “Bred locally in Texas”
Perfect Prey	Not clear	Yes – “Bred locally in USA”
Rodent Pro	Not clear	Yes – “Bred locally in USA”

³ Each supplier was emailed for information about where they farmed their rodents.

Germany and Indonesia

We couldn't find any information on the local production of feeder rodents, or on whether these rodents are imported from other countries, in Germany or Indonesia.

Overall conclusions

- It seems like in the USA, a number of farms are local, whereas in the UK it is likely that a significantly greater proportion are imported.
- It is difficult to find information regarding whether feeder rodents are farmed locally or imported from overseas, particularly in Germany and Indonesia

We conclude that it is likely more promising for a new organization to work in the US as more rodents seem to be farmed locally, compared to in the UK.

5.3 Current regulations for feeder rodents

There is currently very little regulation for the farming of feeder rodents. The regulations that exist in our priority countries are as follows:

- In the UK and EU, it is illegal to feed live rodents to snakes ([Mayne Veterinary Clinic, n.d.](#)). Live feeding is legal in the USA and Indonesia.
- One expert mentioned that within the UK, there may be standards for the slaughter of feeder rodents, but this information could not be found.

5.4 Current animal welfare standards

To evaluate current animal welfare standards, we used [World Animal Protection's Animal Protection Index](#) which evaluates and ranks 50 countries around the world according to their legislation and policy commitments to protecting animals. On this index, A is the best possible ranking and G is the worst possible ranking.

	Ranking for animals used in farming	Ranking for animals used in scientific research
Germany	D	A
Indonesia	F	E
United Kingdom	D	C
USA	E	C

5.5 Overall conclusions

The overall findings by country are summarised below:

Country	Number of snakes	Local production	Mice regulation	Animal regulation	Overall priority
Germany	Moderate	No data	Low	Moderate	Moderate
Indonesia	High	No data	No data	Low	Moderate
United Kingdom	Moderate	Low	Low	Moderate	Moderate
USA	High	High	No data	Moderate	High

Based on this assessment, we think that it is likely most promising to work in the US.

6 Expert views

There were very few experts in this field. We spoke to one researcher who has previously written about farmed feeder rodents for Rethink Priorities ([Šimčikas, 2019](#)), as well as surveying current pet snake owners to understand their perspective and behaviour.

Saulius Šimčikas

Saulius Šimčikas gave a general disclaimer during his expert interview that access to information was a difficulty, and that his report and understanding are based on a shallow to medium depth of research.

The main findings of this conversation are as follows:

- The photos and videos found seem to show fairly bad conditions, but it is unclear how common and representative this is, and it is unclear what the welfare conditions on larger scale farms are, since most of the available photos and videos were from smaller scale operations.
- When asked about where feeder rodents are farmed, Saulius said that although this wasn't a focus of his research, he did find videos of several Americans showing how to farm rodents, which suggests that there is at least some farming in the US

- Saulius also raised the issue of live mice feeding, and that he is aware that it is prohibited in the UK and EU, but is unsure if and where else it is banned.

Pet snake owners

Information was gathered through phone interviews with a small sample of pet snake owners (n=2), from replies to a short survey posted on a snake forum (the questions asked in this survey can be found in [Annex 1](#)), and through secondary data from previous posts on reptile forums about feeder mice welfare. The main findings are summarised below:

- Most pet snake owners in the UK and US seem to buy frozen mice from a store (rather than feeding live mice, breeding their own feeder mice, or using an alternative feed). This may not be the case in all countries.
- It is unclear whether most snake owners are aware of or are concerned about the welfare of feeder rodents. Some may be, but it seems likely that it is a minority.
- From posts on reptile forums, it seems that a reasonable proportion of snake owners do not consider the welfare conditions of feeder rodents ([ReptileForums.co.uk, 2012](#)). However, there were some comments that snake owners are able to distinguish between the quality and welfare of feeder rodents, that this is important to them, and that as a result the majority of producers keep rodents in good conditions.

7 Cost-effectiveness analysis

Our [cost-effectiveness analysis](#) models the impact of interventions to improve feeder rodent welfare in the US. The interventions we have modelled are as follows:

1. Working with farmers to improve welfare conditions on their farms
2. Advocacy to government to ensure that rodent farming is included within existing farmed animal welfare policies and legislation
3. A combined approach of direct work with farmers and government-level advocacy.

The endline metric is the total number of welfare points⁴ (WPs) affected and the number of welfare points affected per dollar by this intervention. The combined approach seems most promising.

⁴ Welfare points are a metric created by Charity Entrepreneurship to evaluate the impact of animal welfare interventions. You can find out more about how this metric was created on [the EA forum](#) as well as an example of how we have used welfare points in the past [to compare the lifetime welfare of different animals](#).

We summarize the main end-line metrics of this cost-effectiveness analysis in the table below:

Intervention	Total WPs affected (if successful)	Total WPs affected (expected)	WPs affected/\$
Working with farmers to improve welfare conditions on their farms	38,808,501.57	3,880,850.16	15.52
Advocacy to government to ensure that rodent farming is included within existing farmed animal welfare policies and legislation	45,276,585.17	1,131,914.63	4.53
Combined approach	84,085,086.74	5,012,764.79	20.05

In the sections below we will discuss the inputs used in this model, how they were estimated, why we used them, and how they are used together to calculate the end-line metric of the number of welfare points affected per dollar.

7.1 Costs

The charity costs were estimated by the Charity Entrepreneurship team and were held constant throughout all of the cost-effectiveness analysis models made during this research round. These costs were estimated based on the country that the intervention was being implemented in (developed or developing) and whether the intervention was a policy change or direct implementation (e.g., working with farmers directly).

The following costs will be modeled:

	Developed country (Policy)	Developing country (Policy)	Developing country (Direct implementation)
Year one	\$100,000	\$100,000	\$100,000
Year two	\$200,000	\$165,000	\$250,000
Year three and beyond (Operating at scale)	\$300,000	\$225,000	\$400,000

7.2 Effects

The overall impact of this intervention is defined in terms of the total number of welfare points affected per dollar. To calculate this we used the cost estimates outlined above and the following inputs:

- Welfare point difference before and after intervention:
 - Baseline welfare: The baseline welfare points of factory farmed feeder rodents was calculated as -33.

The baseline welfare of farmed feeder rodents was estimated using the welfare point system developed by CE, and which considers death, human preference behind veil of ignorance, disease/injury, thirst/hunger, anxiety, environment, biological markers and behaviour. Due to the paucity of direct information on the welfare conditions in rodent farming, we assumed that the conditions are likely similar to other factory farmed animals, and therefore matched some data with previous evidence and estimates from other factory farmed animals.

- Change in welfare after intervention: We estimate that the welfare improvements that this organisation would work towards would increase the welfare of feeder rodents by approximately ~7.67 points.

Because it is unclear what exactly are the current welfare conditions of feeder rodents, and because there is likely to be differences depending on the farm and country, we decided to use two different approaches to this question rather than simply modelling the welfare improvements from specific welfare asks:

- CE team's subjective estimate of the likely percentage improvement in welfare from potential welfare asks
 - Average of the welfare gains of the most promising asks for rodents that we have previously modelled
- Lifespan: our welfare point estimates are estimates of the average well-being of an animal across its lifetime, but it doesn't account for the lifespan of an animal. Therefore, we account for this as a separate input in our cost-effectiveness analysis models. This is important as, for example, although broiler chickens and battery-caged laying hens have very similar

welfare point scores, we may prefer to avert the suffering of a laying hen as their life is longer (0.1 years for a broiler chicken vs. 1.38 years for a laying hen).

- **Sentience:** our welfare point estimates also do not account for the estimated sentience of an animal, so we also account for this as a separate input in our cost-effectiveness analysis models. We think that this is an important parameter to include to compare across interventions that are evaluating working on different species as, for example, you may think that it is more important to work to improve chicken welfare than to improve fish welfare as you are more confident that chickens can suffer – we use estimated sentience to capture this. Our sentience estimates are informed by work from [Open Philanthropy](#) and [Rethink Priorities](#).
- **Probability of success:** This intervention envisioned an approach that worked to improve welfare at both the farmer level, and also advocated for policy change to ensure that rodents are not excluded from farmed animal policy, as we see these two actions as synergistic. We modelled the probability of success of:
 - Interventions at the farmer level: 10%, with 2.5% in Indonesia because there was less evidence of tractability.
 - Advocacy at the government level: 2.5%, with 1% in Indonesia because there was less evidence of tractability

7.3 Where our CEA could go wrong

We considered how our CEA could go wrong in each step. Some general potential issues include:

- **Lack of data leading to a number of estimates**
 - Estimates on the number of feeder rodents is based on inferential data, and conservative estimates were therefore taken. It seems plausible that there is one order of magnitude more feeder rodents, depending on how the inferential data is interpreted e.g. a salmonella outbreak in one small feeder rodent supplier out of Georgia, USA resulted in the recall of millions of mice ([Neuman, 2010](#)), which suggests that the annual production of this small supplier may be tens of millions. Given that our overall estimate of the number of feeder rodents in the USA is 60M, it seems plausible that this is relatively low.

- We estimate that each snake/other reptile eats 1 rodent per week. This is based on Good Practice Guidelines for snake keeping, which says that as a general guide, rodent feeders, such as snakes, should normally be fed every 5–14 days ([Good Practice Guidelines, 2014](#)).
- **Subjectivity of welfare assessment:** Another person could look at the evidence for the current welfare of factory farmed rodents and come to different conclusions.
- **Subjective estimates for probability of success:** Similarly, estimates on the probability of success of this intervention are based on very limited evidence, as there does not appear to be a precedent within this area.
- **Other factors:** With an 80-hour summary report, it is impossible to exhaust every angle. There are likely factors that may affect the CEA in ways that we can not predict. Equally, factors inherent to our modelling may influence the result of the CEA.

8 Implementation

8.1 Crucial considerations

Do feeder mice farms already have good welfare conditions?

We think there is a slim chance that, in the geographies in which it is promising to work, that the conditions that feeder rodents are farmed in is reasonably high. Although it seems like this is unlikely, it is possible as some forums posts by exotic pet owners argue that they are able to distinguish between low and high welfare feeder rodents, and that they preferentially buy high welfare products ([ReptileForums.co.uk, 2012](#)). This in turn may mean that farmed feeder rodents are produced in high welfare conditions to meet this demand.

However, as outlined in [Section 3](#), we think that this is fairly unlikely, and the balance of evidence points to feeder rodents having low welfare conditions. It would be important that an organisation working on this intervention try and clarify the actual welfare conditions of feeder rodents early on, and be aware that there is a small possibility that this intervention no longer looks promising if the conditions are in fact reasonably good.

8.2 Tractability

Although analogies with work with other farmed animals and with rodents used for scientific experiments suggests that this intervention might be tractable, there is also a lack of direct evidence to indicate concern for feeder rodent welfare. As there are no organisations currently working on this so we cannot use existing work as a case study to get a sense of the tractability either.

8.3 Access

There is a significant lack of information on farmed rodents- such as where they are farmed, and in what conditions. The lack of this information is not a problem *per se*, as understanding what the actual welfare considerations and concerns for feeder rodents are would be a necessary part of this organisation's initial work. However, it would be important to ascertain whether or not this information can be obtained. For instance, when we talked to suppliers of feeder rodents they were fairly unwilling to give us information. This may suggest that getting this information, at least on the phone or even potentially at farms, might be difficult.

8.4 Funding

We anticipate that this organisation will mostly get funding from Effective Altruism aligned donors as they are working on a relatively niche issue. This organisation may have some funding difficulties with major Effective Altruism aligned funders if they are unable to demonstrate evidence or inspire confidence in the scale of the problem and the progress that they are making/plan to make.

However, animal testing on rodents is well known to the general public, and a number of people keep mice and rats as pets, which may mean that there is public and funding support.

Overall, there seems to be low-moderate uncertainty that this organisation could secure funding from EAA funders, but significantly greater uncertainty about other sources of funding.

8.5 Neglectedness

This space is extremely neglected with no one else working on improving welfare conditions on feeder rodent farms and only a small number of organizations, such as PETA, focused on awareness raising.

8.6 Scale of the problem

The number of feeder rodents farmed seems to be less than other factory farmed animals. This may make working on this issue less appealing, however, given the neglectedness of people working on improving the welfare of feeder rodents, as well as the likely geographical concentration of feeder rodent farms, this may not be a significant concern.

8.7 Externalities

The main positive externality of work in this space is that improving the welfare of feeder rodents may expand the moral circle of key stakeholders to the welfare concerns of feeder rodents and pets.

On the other hand, there are several potential negative externalities of improving feeder rodent welfare:

1. **Increases in price of frozen feeder rodents from welfare improvements on farms might cause pet snake owners to switch to breeding their own mice or to use other feed animals**

Talking to experts and looking at the dietary requirements of snake species that are commonly kept as pets, it seems unlikely that consumption would switch to other animals e.g. insects.

However, it does seem plausible that reptile owners could switch to breeding their own mice. This could cause two problems. Firstly, it is unclear whether the conditions that reptile owners breed rodents in and slaughter them in would be better or worse than factory farms. However, on balance, it seems likely that most people breeding and slaughtering mice at home would keep them at a standard that is comparable or better than a factory farm. The second problem is that a shift to home-bred feeder mice would make future welfare improvements for feeder rodents much more difficult as their production will be less centralised, and it would be nearly impossible to enforce practices in people's home.

2. **Increasing the welfare requirements for feeder rodents in a particular geography might increase the price of farming, and shift production to other countries with poorer welfare standards and/or a country in which it is harder to make any welfare improvements.**

This could be mitigated by looking for welfare improvements that are cost neutral, and/or by regulation at the supply side.

- 3. This organization could unintentionally bring awareness to the possibility of owning snakes and other reptiles as pets and therefore increase pet ownership.**

Given that owning a pet snake is not that uncommon and that these campaigns are unlikely to attract significant broader public attention, we think that the risk of this is unlikely.

9 Conclusion

Overall, and in comparison to the other interventions considered in this cause area, we think that this is not an idea worth recommending to future charity founders due to the remaining uncertainties in the space.

Annex 1 – Survey of pet snake owners

1. Where do you currently get your rodents from?
 - a. I grow my own
 - b. I buy them from a store: Please specify
 - c. Other: Please specify

2. Are you aware of the welfare conditions that feeder rodents that you use are produced under?
 - a. Yes
 - b. No
 - c. Other: Please specify

3. Would you be willing to pay a bit more for feeder rodents if you knew they were farmed under better conditions?
 - a. Yes
 - b. No
 - c. Other: Please specify

This survey was posted on [Our Reptile Forum](#).

References

- AAP Rescue Centre for Exotic Animals and Eurogroup for Animals (2015). AFC – Positive List. Available at:
<https://www.prijatelj-zivotinja.hr/index.en.php?id=1759> (Accessed 25 October 2022)
- alamy (n.d.a). White Mice grown for live reptile feed on farm. Available at:
<https://www.alamy.com/white-mice-grown-for-live-reptile-feed-on-farm-image9897871.html> (Accessed 25 October 2022)
- alamy (n.d.b). White Mice grown for live reptile feed on farm. Available at:
<https://www.alamy.com/white-mice-grown-for-live-reptile-feed-on-farm-image9897866.html> (Accessed 25 October 2022)
- Allen (2015). More Snakes Added To U.S. Banned Species List. Available at:
<https://www.npr.org/2015/03/09/391795448/reptile-breeders-angry-more-snakes-added-to-banned-species-list?t=1544366478687> (Accessed 25 October 2022)
- amazon.co.uk (n.d.). Online Reptile Shop Frozen Mice Fuzzies 4–6g, 25 Pack. Available at:
https://www.amazon.co.uk/Online-Reptile-Shop-Frozen-Fuzzies/dp/B088P6QCSS/ref=asc_df_B088P6QCSS/?tag=&linkCode=df0&hvadid=430752445656&hvpos=&hvnetw=g&hvrand=2008730202740052350&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcm dl=&hvlocint=&hvlocphy=1006886&hvtargid=pla-929925657349&ref=&adgrpid=100431049659&th=1 (Accessed 25 October 2022)
- American Veterinary Medical Association (2012). U.S. Pet Ownership Statistics. Available at:
<https://web.archive.org/web/20190223192835/https://www.avma.org/KB/Resources/Statistics/Pages/Market-research-statistics-US-pet-ownership.aspx> (Accessed 25 October 2022)
- Animals in Science Regulation Unit (2014). Code of Practice for the Housing and Care of Animals Bred, Supplied or Used for Scientific Purposes. UK Government. Available at:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/388293/CodePracticeHousingCareAnimals.pdf (Accessed 25 October 2022)
- Bailoo et al. (2018). Effects of Cage Enrichment on Behavior, Welfare and Outcome Variability in Female Mice. Available at:
<https://www.frontiersin.org/articles/10.3389/fnbeh.2018.00232/full> (Accessed 25 October 2022)
- Bansal (2022). Rodent welfare approaches. Charity Entrepreneurship. Available at:

- https://docs.google.com/spreadsheets/d/1D6Qs7s_UdaJtT7r0TcE3xBIBrirt85gkkZ0Wx4--0/edit#gid=0 (Accessed 25 October 2022)
- Bedford (2021). Number of pet reptiles in the European Union in 2021, by country. Statista. Available at: <https://www.statista.com/statistics/515455/reptile-population-european-union-eu-by-country/> (Accessed 25 October 2022)
- Big Cheese Rodent Factory (n.d.). Frozen Feeder Mice - The Big Cheese Rodent Factory. Available at: <https://bigcheeserodents.com/product-category/frozen-feeder-mice/> (Accessed 25 October 2022)
- Bodenham (2021). Pet food organisation launches raw food certification scheme. Available at: <https://manypets.com/uk/articles/pet-food-organisation-launches-raw-food-certification/> (Accessed 25 October 2022)
- Brochu (2018). Effects of Nesting Material on the Toxicologic Assessment of Cyclophosphamide in Crl:CD1(ICR) Mice. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6059214/> (Accessed 25 October 2022)
- Buzzard Reptile (n.d.). Frozen Mice - Frozen Reptile Food | Buzzard Reptile. Available at: <https://buzzardreptile.co.uk/product/frozen-mice/> (Accessed 25 October 2022)
- Chandar (2017). From Iceland – Ask An Expert: Can I Have A Pet Snake? Available at: <https://grapevine.is/mag/articles/2017/07/11/ask-an-expert-can-i-have-a-pet-snake/> (Accessed 25 October 2022)
- Charity Entrepreneurship (2018a). Is it better to be a wild rat or a factory farmed cow? A systematic method for comparing animal welfare. Available at: <https://forum.effectivealtruism.org/posts/cimFBObpjntoBAKCq/is-it-better-to-be-a-wild-rat-or-a-factory-farmed-cow-a-1> (Accessed 25 October 2022)
- Charity Entrepreneurship (2018b). From humans in Canada to battery caged chickens in the United States, which animals have the hardest lives: results. Available at: <https://forum.effectivealtruism.org/posts/g57AjP4HqTmfFTAde/from-humans-in-canada-to-battery-caged-chickens-in-the> (Accessed 25 October 2022)
- The European Pet Food Industry (2020). FACTS & FIGURES 2020 European Overview. Available at: https://drive.google.com/file/d/1ER8F1E3gwX2g3Tl5aGpxPziCuyOj-1p_/view?usp=sharing (Accessed 25 October 2022)
- evolutionreptiles.co.uk (n.d.). Frozen Mice | Evolution Reptiles. Available at: <https://www.evolutionreptiles.co.uk/food/frozen-reptile-food/frozen-mice/>

(Accessed 25 October 2022)

Fawcett (2012). Guidelines for the Housing of Mice in Scientific Institutions.

Available at:

https://www.animaethics.org.au/___data/assets/pdf_file/0004/249898/Guideline-22-mouse-housing.pdf (Accessed 25 October 2022)

FeederSource (n.d.). Frozen Mice. Available at:

https://www.feedersource.com/category_s/1870.htm (Accessed 25 October 2022)

Food Standards Agency (2022). FSA welcomes UK ban on all feeder rodent imports from Lithuania used as pet food. Available at:

<https://www.food.gov.uk/news-alerts/news/fsa-welcomes-uk-ban-on-all-feeder-rodent-imports-from-lithuania-used-as-pet-food> (Accessed 25 October 2022)

Gaskill et al. (2013). Impact of nesting material on mouse body temperature and physiology. Available at:

<https://www.sciencedirect.com/science/article/abs/pii/S0031938413000048> (Accessed 25 October 2022)

Good Practice Guidelines (2014). Good Practice Guidelines for the welfare of Reptiles & Amphibians. Available at:

https://3851531.app.netsuite.com/core/media/media.nl?id=2196061&c=3851531&h=O1dSnnUpy9P53EvIVtBYKn3tHSY8Y21A3MmssPKDftPG1AG&_xt=.pdf (Accessed 25 October 2022)

gov.uk (n.d.). Apply for a licence to keep a wild animal. UK Government. Available at:

<https://www.gov.uk/licence-wild-animal> (Accessed 25 October 2022)

Hardin (2017). Best Management Practices for Feeder Rodent Production and Distribution. Available at:

<https://petadvocacy.org/wp-content/uploads/2022/02/Feeder-Rodent-Best-Management-Practices.pdf> (Accessed 25 October 2022)

Hobson (2021). EU-wide animal research statistics, 2018. Understanding Animal Research. Available at:

<https://www.understandinganimalresearch.org.uk/news/eu-wide-animals-in-research-statistics-for-2018-released#> (Accessed 25 October 2022)

legislation.gov.uk (2007). The Welfare of Farmed Animals (England) Regulations 2007. UK Government. Available at:

<https://www.legislation.gov.uk/uksi/2007/2078/schedule/1/made> (Accessed 25 October 2022)

Mayne Veterinary Clinic (n.d.). Health and welfare information about your reptile from Vetlexicon Exotis/Reptile. Available at:

https://www.maynevets.co.uk/wp-content/plugins/vetstream_swagger/pet-h

- ealth/pet/pet_info_print.php?vetstream-type=ZXhvdGlzL3JlcHRpbGVz&node_guid=68fc5d6c-a913-4fa5-98b2-e8c0448a265e (Accessed 25 October 2022)
- Monkfield Reptile (n.d.). Monkfield Mice | Monkfield Reptile. Available at: <https://www.monkfieldreptile.com/monkfield-mice> (Accessed 25 October 2022)
- Muehlhauser (2017). 2017 Report on Consciousness and Moral Patienthood. Open Philanthropy. Available at: <https://www.openphilanthropy.org/research/2017-report-on-consciousness-and-moral-patienthood/> (Accessed 25 October 2022)
- National Centre for the Replacement Refinement & Reduction of Animals in Research (2021). Housing and husbandry: Mouse. Available at: <https://www.nc3rs.org.uk/3rs-resources/housing-and-husbandry-mouse> (Accessed 25 October 2022)
- National Research Council (US) Committee for the Update of the Guide for the Care and Use of Laboratory Animals (2011). Guide for the Care and Use of Laboratory Animals. 8th edition. Washington (DC): National Academies Press (US). Available at: <https://grants.nih.gov/grants/olaw/guide-for-the-care-and-use-of-laboratory-animals.pdf> (Accessed 25 October 2022)
- Neuman (2010). Added to the Recall List: Millions of Frozen Mice. The New York Times. Available at: <https://www.nytimes.com/2010/07/30/business/global/30mice.html> (Accessed 25 October 2022)
- Nmoffat (2016). Is this the weirdest kind of farm on the Sunshine Coast? Courier Mail Australia. Available at: <https://www.couriermail.com.au/news/queensland/sunshine-coast/is-this-the-weirdest-kind-of-farm-on-the-sunshine-coast/news-story/fc43534307bd681b06e14764a05eff31> (Accessed 25 October 2022)
- Our Reptile Forum (2022). What do you feed your snake? Available at: <https://ourreptileforum.com/community/threads/what-do-you-feed-your-snake.25130/> (Accessed 25 October 2022)
- Peregrine Live Foods (n.d.). Frozen Mice - Peregrine. Available at: <https://peregrine-livefoods.co.uk/product-category/reptile/frozen-food/frozen-mice/> (Accessed 25 October 2022)
- perfectprey.com (n.d.). Frozen Rodents, Feeder Insects & Snake Food For Sale. Available at: <https://perfectprey.com/> (Accessed 25 October 2022)
- PETA (n.d.). Animals Frozen Alive, Crudely Gassed at Petco, PetSmart Supplier. PETA. Available at: <https://investigations.peta.org/animals-gassed-frozen-petco-petsmart/>

(Accessed 25 October 2022)

Pet Food Manufacturers Association (2012). Pet Population 2008 To 2012 | PFMA. Available at: <https://www.pfma.org.uk/pet-population-2008-2012> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2013). Pet Population 2013 | PFMA. Available at: <https://www.pfma.org.uk/pet-population> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2014). Pet Population 2014 | PFMA. Available at: <https://www.pfma.org.uk/pet-population-2014> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2015). Pet Population 2015 | PFMA. Available at: <https://www.pfma.org.uk/pet-population-2015> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2016). Pet Population 2016 | PFMA. Available at: <https://www.pfma.org.uk/pet-population-2016> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2018). Pet Population 2018 | PFMA. Available at: <https://www.pfma.org.uk/pet-population-2018> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2019). PFMA Releases Its NEW Top Ten Pets 2019 – Pets Are The Tonic For Yappy Days | PFMA. Available at: <https://www.pfma.org.uk/news/pfma-releases-its-new-top-ten-pets-2019> (Accessed 25 October 2022)

Pet Food Manufacturers Association (2021). Pet Population 2021 | PFMA. Available at: <https://www.pfma.org.uk/pet-population-2021> (Accessed 25 October 2022)

Pritchett-Corning et al. (2009). Breeding and Housing Laboratory Rats and Mice in the Same Room Does Not Affect the Growth or Reproduction of Either Species. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2755018/> (Accessed 25 October 2022)

reptilecentre.com (n.d.). PLT Frozen Mice Pinkies 1g+ 25-Pack. Available at: https://www.reptilecentre.com/plt-frozen-mice-pinkies-1g-25pack_p32495264.htm (Accessed 25 October 2022)

ReptileForums.co.uk (2010). rodent farms | Page 7 | Reptile Forums. Available at: <https://www.reptileforums.co.uk/threads/rodent-farms.439427/page-7> (Accessed 25 October 2022)

ReptileForums.co.uk (2012). moral issues of feeding mice/rats/multimammates to snakes | Page 1 | Reptile Forums. Available at: <https://www.reptileforums.co.uk/threads/moral-issues-of-feeding-mice-rats-multimammates-to-snakes.815052/> (Accessed 25 October 2022)

rodentpro.com (n.d.). Frozen Feeder Rodents. Available at: <https://www.rodentpro.com/#> (Accessed 25 October 2022)

RSPCA (2011). Good practice for humane killing. Available at: <https://science.rspca.org.uk/documents/1494935/9042554/Good+practice+for+humane+killing+%28PDF+388KB%29.pdf/097fc2fb-4025-3017-8f8b-3164e7>

- [4b6abc?t=1552922693251](#) (Accessed 25 October 2022)
- RSPCA (n.d.). Creating a Good Home For Mice | RSPCA. Available at: <https://www.rspca.org.uk/adviceandwelfare/pets/rodents/mice/environment> (Accessed 25 October 2022)
- Schukraft (2019). Opinion: estimating invertebrate sentience. Rethink Priorities. Available at: <https://rethinkpriorities.org/publications/opinion-estimating-invertebrate-sentience> (Accessed 25 October 2022)
- Šimčíkas (2019). Rodents farmed for pet snake food. Rethink Priorities. Available at: <https://rethinkpriorities.org/publications/rodents-farmed-for-pet-snake-food> (Accessed 25 October 2022)
- Šimčíkas (2020). Estimates of global captive vertebrate numbers. Rethink Priorities. Available at: <https://rethinkpriorities.org/publications/estimates-of-global-captive-vertebrate-numbers> (Accessed 25 October 2022)
- SwellReptiles (n.d.). Swell Frozen Mice. Available at: <https://www.reptiles.swelluk.com/swell-frozen-mice> (Accessed 25 October 2022)
- Theil et al. (2020). The epidemiology of fighting in group-housed laboratory mice. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7538892/> (Accessed 25 October 2022)
- Tyler (2020). How certifications can help pet food live up to the label. Available at: <https://www.petfoodprocessing.net/articles/13634-how-certifications-can-help-pet-food-live-up-to-the-label> (Accessed 25 October 2022)
- Underground Reptiles (n.d.). Frozen Mice & Rats For Sale - Underground Reptiles. Available at: <https://undergroundreptiles.com/product-category/feeders/frozen-feeder-mice-rats/> (Accessed 25 October 2022)
- Understanding Animal Research (n.d.). Cosmetics. Available at: <https://www.understandinganimalresearch.org.uk/regulation/cosmetics> (Accessed 25 October 2022)
- Vasbinder and Locke (2016). Introduction: Global Laws, Regulations, and Standards for Animals in Research. Available at: <https://academic.oup.com/ilarjournal/article/57/3/261/3796595> (Accessed 25 October 2022)
- World Animal Protection (2020a). Germany | World Animal Protection. Available at: <https://api.worldanimalprotection.org/country/germany> (Accessed 25 October 2022).
- World Animal Protection (2020b). Indonesia | World Animal Protection. Available

at: <https://api.worldanimalprotection.org/country/indonesia> (Accessed 25 October 2022).

World Animal Protection (2020c). Animal Protection Index. Available at:

<https://api.worldanimalprotection.org/> (Accessed 25 October 2022).

World Animal Protection (2020d). United Kingdom | World Animal Protection.

Available at: <https://api.worldanimalprotection.org/country/united-kingdom> (Accessed 25 October 2022).

World Animal Protection (2020e). USA | World Animal Protection. Available at:

<https://api.worldanimalprotection.org/country/usa> (Accessed 25 October 2022).

World Trade Organization (2012). Article XX General Exceptions. Available at:

https://www.wto.org/english/res_e/booksp_e/gatt_ai_e/art20_e.pdf (Accessed 25 October 2022).

YouTube (2006). Mice at the snake farm. Available at:

<https://www.youtube.com/watch?v=OwZriJJZRjs> (Accessed 25 October 2022)

YouTube (2017). Feeder rodent breeding. Available at:

<https://www.youtube.com/watch?v=jqfUsLN7ckI> (Accessed 25 October 2022)

YouTube (2018a). Our rat room has GROWN! See the rat breeding EXPANSION!!

Available at: <https://www.youtube.com/watch?v=zLSKEiiSXaU> (Accessed 25 October 2022)

YouTube (2018b). How to maintain a colony of 80 female rats. Available at:

<https://www.youtube.com/watch?v=CPe3Kf7G8b0> (Accessed 25 October 2022)

YouTube (2018c). Small Scale Mouse Breeding: Housing, Feeding, and Watering.

Available at: <https://www.youtube.com/watch?v=HLtb1SojNWk> (Accessed 25 October 2022)