# Reptiles and Amphibians are not as bad for the environment as people think.

## ABSTRACT

Owning a reptile or amphibian, or multiple, inevitably comes with a stigma. There are frequent complaints by people who do not own these creatures about their environmental impact. These complaints perpetuate the idea of their husbandry or care having a much larger impact on the environment, adding to things such as global warming and climate change. However, while this does have some truth to it, as I will show with my data, the claim that owning a reptile or amphibian should be written off completely by many, and shown to be terrible for the environment by others, is unfounded. I have investigated this topic, as measured by three criteria, food production and consumption, energy usage, and escapes into the environment. My results show that reptiles and amphibians largely have a lesser impact on all three counts than traditional companion animals.

## AIMS

The aim of my research is to investigate the husbandry and care of different types of animals, to look at the bigger picture, and discuss questions that delve deeper into the environmental impact of reptile and amphibian husbandry, compared to that of traditional companion animals.

## HYPOTHESES

Based on my prior knowledge of these animals, and secondary data and research I have performed in the past that I have detailed in my results, my hypothesis is that, overall, herptiles will end up having a lesser impact on the environment than common companion animals, as measured by three criteria. The first will be that the food of reptiles and amphibians, and the production of it, will have a lesser carbon footprint than the food of commonly owned mammals. The second will be that reptiles and amphibians use more energy in buildings and homes when kept as pets than dogs and cats, because of their need for heating and constant lamps. The final will be that fewer reptiles and amphibians go missing from homes, or are released into the wild, than dogs, cats, and similar companion animals, and therefore also has a lesser impact on the environment.

## MATERIALS & METHODS

### Secondary Research:

I have completed a literature review to collect secondary data on pet food production processes and their relation to greenhouse gas emissions, average UK home energy consumption and carbon footprint, and rates of missing or released animals. My sources included news articles from the BBC, WWF, British Gas, and other publications via Google searches.

**Primary Research:**

I have designed an online survey to collect primary data on people's pet feeding habits, using Google Forms, and sent it out to people using Whatsapp, Gmail, and Facebook. I collected and interpreted my data using Google Forms. A copy of my questionnaire questions are in the annex of this report. I also observed and recorded missing animal reports on a Facebook group with a systematic data collection method - tallying each animal in a table of species from across two months, once in January, and once in June.

**Mixed Primary and Secondary Research:**

For my energy collection methods, I looked at energy bills from various sources such as my tutor, my friend, my own home, and read articles and annual reports by businesses/charities/companies to find estimates of how much energy they are using. I also took pictures of electricity meter readings from The Reptile Academy for more primary data. I analysed this data, standardised the results into kWh per month, and also applied the appropriate carbon footprint multiplier, depending on the energy provider.

## RESULTS

**Result 1, Food:**

To begin with, I looked at food. What exactly are people feeding their pets, and how often are they feeding them? Furthermore, what is the carbon footprint of what people are feeding their pets?

For my primary data on this point, I put out a questionnaire to a few FaceBook groups that involve reptiles, and other pets, but my tutor also put it out to people he knew personally who have pets of all kinds. I found that, of the 10 responses I received, 7 of them owned a commonly owned mammal (such as dogs, cats etc.), and 3 of them owned small to medium reptiles (such as geckos, lizards etc.). Of the 70% who owned commonly owned mammals, 100% of them selected that they fed their pets twice a day. Therefore, both the secondary data I found, and the primary data I collected, suggests that people who own dogs and cats feed their pets twice a day, on average.

Also on my questionnaire was the question **'What type of food do you primarily feed your pet? (Along with fruit and vegetables, for example)**'. The responses to this were more varied, but 60% of responses were 'Dry (Kibble)'. Therefore, my primary data supports the conclusion that, on average, people who own dogs and cats are more likely to feed their pets dry food.

As for secondary data, I found a similar result, in that, on average, dog or cat owners will feed their pets processed foods such as tinned/canned wet foods, or dry foods like kibble. A study by **Giada Morelli, Davide Stefanutti,** and **Rebecca Ricci** in 2021, labelled ***'A Survey among Dog and Cat Owners on Pet Food Storage and Preservation in the Households'*** proves this, by showing that, of a total of 2221 participants in their online questionnaire (1545 dog owners, and 676 cat owners), 75.7% fed their pets kibble. Furthermore, the owners who feed their pets kibble ***'usually bought one (50.1%) or two***

***(24.6%) packages at a time, and most pets (64.4%) took a minimum four weeks to consume an entire bag'.***

These statistics are interesting to me, because an article on CBBC Newsround in 2022 labelled ***'Study analyses environmental impacts of pet diets',*** discussed what Brazilian researchers found when they studied the production of over 900 types of dog and cat food. Firstly, they found that ***'The top three countries in the world for dogs are the US, China and Brazil - and it's estimated there are 156 million dogs and 133 million cats expecting their two regular meals a day'.*** Therefore, we can assume, based on these studies, that these pet owners are mostly feeding their pets kibble, twice a day.

With this in mind, the same study in Brazil found that ***'producing the food for an average 10kg dog on dry kibble would create about 830kg of carbon dioxide (CO2) per year'.***

However, with reptiles and amphibians, food is a completely different story. Primarily, keepers with these animals will feed their pets either feeder rodents, or insects. I could not find any research or statistics on the environmental effect of breeding feeder rodents, such as mice and rats, so I am using insects, and insect breeding, for this example.

The consumption of insects is actually being encouraged for both humans and animals by various scientific researchers, including Professor Arnold van Huis, a ***'tropical entomologist at Wageningen University, the Netherlands'*** *(Wageningen University website),* who has said ***'Nutritionally, it's absolutely equivalent to meat products. The extra advantage of insects is that you may have health benefits.'*** (***Eating insects: 'Good for your health, the planet and nutritionally equivalent to meat'*** - European Science-Media Hub, January 10, 2024), and Dr. Duncan Sivell, who has been ***'studying entomology for 18 years'*** (Natural History Museum website), has said ***'The massive advantage of introducing entomophagy*** (eating insects) ***into our diets is the respective resources needed by the two systems. Economically and ecologically, it's much more efficient to rear insects than livestock.'*** (***'Eat insects, save the world'*** - Natural History Museum website). Based on these statements, we can say that, biologically, consuming edible insects is generally a good idea. However, what about the production of insects? How does it have an impact on the environment?

In Chapter Ten of ***'Greenhouse gases emission from edible insect species',*** by **Muhammad Jafir, Muzamil Abbas, Muhammad Irfan, and Muhammad Zia-Ur-Rehman,** they state that ***'Livestock agriculture is responsible for nearly 18% of the world's greenhouse gas emissions'.*** This is intriguing to me because of how much livestock is used for dog and cat kibble. When we compare it to Locusts *(Schistocerca gregaria)*, one of the most common insects fed to reptiles and amphibians, the same paper says, ***'1 kg of locusts resulted in the emission of only 1.2 kg of CO2 equivalents. In contrast, the production of 1 kg of beef was found to emit 32.3 kg of CO2 equivalents.'*** The paper also goes on to say, ***'Locusts also have a lower ecological footprint compared to conventional livestock.'*** So, it would be fair to say that, based on this paper, locusts are far better for the environment to produce than traditional livestock. However, what about other insects? I am aiming for an **unbiased conclusion** in this work, so I will also mention Waxworms *(Galleria mellonella)*, as, in the same Muhammad Jafir et al. paper, they state ***'study conducted by researchers at the University of Exeter… the larvae of the***

***waxworm emit significant amounts of CH4 gas, a potent GHG (greenhouse gas)'.*** Therefore, not all insects that are commonly fed to herptiles are the best option in terms of environmental impact. However, another insect that is often used for this purpose is the Cricket *(Acheta domesticus)*, which is mentioned in the same paper when they say, ***'producing 1 kg of cricket protein generates 99% fewer greenhouse gases than producing 1 kg of beef protein. Additionally, crickets require significantly less feed than cattle, sheep, and pigs to produce the same amount of protein.'***

Overall, based on my research, I would feel comfortable saying that producing and processing insects for consumption has a smaller impact on the environment, particularly in terms of climate change and global warming, than producing and processing livestock into dog and cat food, and, by extension, feeding herptiles is a more environmentally friendly practice than feeding cats and dogs.

## Result 2, Energy Usage:

Another common complaint about reptile and amphibian owners is how much energy is consumed by using things like heating sources throughout vivariums and enclosures, which aren't necessary for people who own more 'common' pets, such as cats, or dogs.

In this section, I will compare two different sections of energy usage, domestic, and commercial. Domestic will be defined as an average household of people with pets. Commercial will be defined as a trading business or charity who take care of pets and animals.

These are my results from looking at energy bills from various sources (e.g. my tutor, my friend, my own home), and reading articles and annual reports by businesses/charities/companies to find estimates of how much energy they are using.

**<u>Commercial</u>**

| Sample | Primary or Secondary data | Electricity use (kWh) | Period | Standardised kWh per month | Calculated carbon footprint per year |
|---|---|---|---|---|---|
| Reptile Academy July-August 2025 (British Gas) | Primary (meter readings) | 1,343 | 2 weeks | 2,686 (28 days) | (2686kWh x 13) months x 116g/1000 = 4,050.5kg carbon/year |
| Reptile Academy June-July 2025 (British Gas) | Primary (energy bill) | 2,575.4 | 1 month | 2,575.4 | (2575.4) x 12 x 116g/1000 = 3,584.9kg/year |

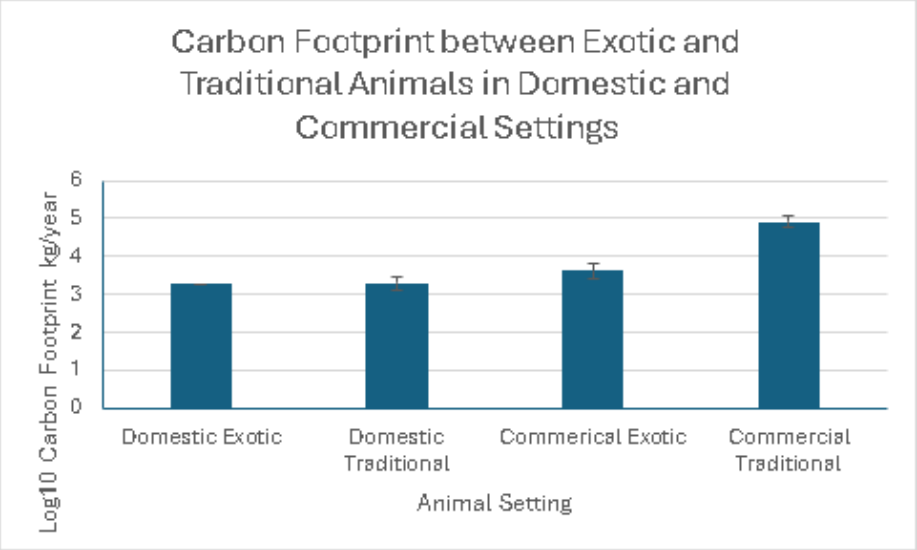
| | | | | | |
|---|---|---|---|---|---|
| Reptile Academy September 2024 (Yu Energy) | Primary (energy bill) | 2,412.3 | 1 month | 2,412.3 | (2412.3 x 12) x 222g/1000 = 6,426.4kg/year |
| Reptile Academy October 2024 (Yu Energy) | Primary (energy bill) | 1,946.5 | 1 month | 1,946.5 | (1946.5 x 12) x 222g/1000 = 5,185.5kg/year |
| Reptile Academy August 2024 (Yu Energy) | Primary (energy bill) | 1,019 | 1 month | 1,019 | (1019 x 12) x 222g/1000 = 2,714.6kg/year |
| All Dogs Trust Centres 2024 | Secondary (Dogs Trust website) | 8,005,761 | 12 months | 667,146.75 | (667146.75 x 12) x 222g/1000 = 1,777,278.9kg/year |
| Average Dogs Trust Centre 2024 (All divided by 22) | Secondary (Dogs Trust website, computations) | 363,898.23 | 12 months | 30,324.85 | (30324.85 x 12) x 222g/1000 = 80,785.4kg/year |

**Domestic**

| **Sample** | **Primary or Secondary data** | **Electricity use (kWh)** | **Period** | **Standardised kwh per month** | **Calculated carbon footprint per year** |
|---|---|---|---|---|---|
| Average home with 13 herptile pets 19th July 2025 - 26th July 2025 | Primary | 189 | 1 week | 756 | (756 x 12) x 222g/1000 = 2,013.98kg/year |

| | | | | | |
|---|---|---|---|---|---|
| Average home with 20 herptile pets September 2022 (Ovo Energy) | Primary | 465.50 | 1 month | 465.50 | (465.5 x 12) x 222g/1000 = 1,240.09kg/year |
| Average home with 20 herptile pets December - January 2023 (Ovo Energy) | Primary | 1,074.08 | 1 month | 1,074.08 | (1,074.08 x 12) x 222g/1000 = 2,861.14kg/year |
| Average home with 1 dog, 1 cat June - July 2025 (Ovo Energy) | Primary | 538.19 | 1 month | 538.19 | (538.19 x 12) x 222g/1000 = 1,433.74kg/year |
| Average home with 1 dog, 1 cat January 2025 (Ovo Energy) | Primary | 536.8 | 1 month | 536.8 | (536.8 x 12) x 222g/1000 = 1,430.04kg/year |

As for any additional secondary data, I found that, according to the article ***'What is the average energy bill in Great Britain?',*** by British Gas, which was updated in 2025, the average UK household uses ***'2,700 kWh'*** of energy per year, which equates to roughly 225 kWh per month (for dual fuel customers). If we calculate this into an estimated yearly carbon footprint, we get 2700 x 116g/1000, which equals 313.2kg of carbon per year.




*Graph 1. Carbon footprint between exotic and traditional animals in domestic and commercial settings based on British Gas kg/kWh conversion rates. Data has been transformed with Log10 to bring data within a comparable range, and to perform a standard deviation. Error bars shown are standard deviation and as they overlap between Domestic Exotic, Domestic Traditional, and Commercial Exotic, there is no real difference in carbon footprint between these groups. As the Commercial Traditional group has a far increased carbon footprint than all other groups, and that the standard deviation bars do not overlap, this is a real, significant difference. Standard deviation calculations are shown in the annex.*

Also, an article from 2016, ***'Pets Cost Home Owners £78million in Energy Bills',*** by Housing Energy Advisor, states that ***'research conducted by the Energy Saving Trust suggests that £78million a year extra is being spent on gas and electric by pet owners in the UK',*** which, although does not give us the average kWh per pet owning household, it does give us an indication that people who own pets are more likely to use more energy and gas. Also, in this article, they only mention statistics from cats and dogs as pets, not herptiles at all, which I find interesting, because it demonstrates how reptiles and amphibians, although growing in popularity, still have a deficit in research about them in lots of areas, especially as pets.

A final thing I found interesting about my data is that, despite The Reptile Academy having more animals at their centre monthly, 69, than Dogs Trust does, roughly 51 per centre per month, Dogs Trust still used more energy per animal overall.

Based on my research, I would say that caring for common companion animals in commercial circumstances actually has a bigger carbon footprint than caring for herptiles. However, caring for companion animals in domestic circumstances has a smaller carbon footprint than caring for herptiles. Therefore, the argument that reptiles and amphibians as pets should be discouraged or frowned upon for the reason of how much energy they use must be researched further before a conclusion can be made.

**RESULT 3, IMPACT ON THE WILD:**

Another important point we can use to compare the environmental impact of reptiles and amphibians vs common mammals and companion animals is how often they go missing, or are released into the wild. Every animal that is lost, or put into the wild, has an impact on our natural ecosystems and wildlife.

For my primary data on this, I searched through the '**Animals Lost Found Needing Help Dorset**' FaceBook group, and wrote down the numbers of different types of animal I found that was missing, once in January 2025, and once in June 2025. I took data from two different months to discover any relationship or correlation between the weather and the type of animal.

In January 2025, I found that a total of 87 animals were reported missing on the group, consisting of 42 cats, 36 dogs, 4 birds, 3 ferrets, and 2 horses. This means that only roughly 7.83% of these animals are considered to be less common companion animals, and there was not one reptile or amphibian reported.

In June 2025, I was surprised to find that there was a decrease in the number of animals reported missing in this month, as I would have expected an increase, due to warmer weather. The main reasons I thought warmer weather would increase the number of animals going missing are that, often, animals prefer being outside in the sun, or to cool down, which could lead to them running away, and also that more doors and windows are opened in the heat to increase airflow and cool down, which could lead to animals escaping. However, there were only a total of 77 animals reported missing in the group this month, consisting of 46 cats, 25 dogs, 2 birds, 2 sheep, 1 ferret, and 1 rabbit. Once again, the percentage of animals that are considered to be less common companion animals is low, at roughly 4.62%.

For my secondary data on this point, I researched both the National Centre for Reptile Welfare (NCRW) and the Royal Society for the Prevention of Cruelty to Animals (RSPCA) websites, and annual reports and statistics. In 2023, NCRW reported that they took in 2611 animals (or, more specifically, herptiles) from all across the UK, stating that 521 of those animals were considered 'rescues' - ***'surrendered by third party, not owner'*** *(Charity Commission Annual Return 2023 The National Centre for Reptile Welfare (NCRW) Charity registration number: 1195393)*. Of these 521 rescue animals, **22.65%** were due to 'Death of Owner', and **19.58%** of them were 'Found in the Wild', with **12.09%** of them 'Abandoned'.

When we compare these statistics to the 2023 Annual Review by the RSPCA, which states in their ***'Animal Outcomes from our Shelters, Care and Adoption Centres 2023-24',*** they state that they took in **81,669** animals in that timeframe, with only **7,456**, or **9.13%**, of them being 'wild animals'. The RSPCA website defines a 'wild animal' as ***'those that aren't normally domesticated',*** which includes reptiles and mammals, but I cannot find data on the percentage of each specifically. Therefore, we can state that, although reptiles and amphibians do need rescuing for various reasons, their numbers are far lower than those of common companion mammals.

Now, although the numbers from the RSPCA may seem like much more than the NCRW's, remember that the RSPCA has been a charity for far longer, over 200 years, as opposed to the NCRW's 8 years. This means that, not only do the RSPCA have far more funding, but they're also a more trusted and known source. Another reason why the NCRW may have so

many fewer animals is because they only specifically take in reptiles and amphibians, whereas the RSPCA takes in every type of animal.

Therefore, based on my research, I would make the conclusion that herptiles have a smaller environmental impact in terms of how often they go missing, or are found in the wild, although of course the smaller amounts of total herptile pets is far lower than that of common companion animals, such as cats and dogs.

## DISCUSSION

Overall, I am very happy with my first research project. I feel that I have overcome a lot of challenges while conducting it, but I stayed resilient, and that my research is enough to make some fairly reliable statistical conclusions. I have also enjoyed conducting parts of this research, and I feel that, now that I have completed a research project, I will be better equipped to do so in further education. I also feel that I have adequately shown that reptiles and amphibians are often misunderstood, and that their environmental impact isn't nearly as great as people may think.

Result 1 showed that the global environmental impact of breeding and creating edible insects for consumption is much smaller than breeding and creating livestock for consumption. This means that, overall, feeding herptiles has a lesser impact on the environment, especially in terms of greenhouse gas emissions, than feeding cats, dogs, and other carnivorous companion animals.

Result 2 showed that, in the UK, caring for common companion animals in commercial circumstances has a bigger carbon footprint than caring for herptiles, but it also showed that caring for companion animals, such as dogs or cats, in domestic circumstances, has a smaller carbon footprint than caring for herptiles. This means that my results were inconclusive, and further research must be conducted before a final conclusion can be reached.

Result 3 showed that, in the UK, the rates of reported common companion animals going missing, or being released into the wild, are much higher than those of herptiles. This means that herptiles have a much smaller environmental impact than common mammals in this sense, because missing or released animals all impact the environment in one way or another.

My results do, overall, prove my main hypothesis that reptiles and amphibians have a lesser impact on the environment than common companion animals such as cats and dogs. This is because, in both Result 1 and Result 3, in both my primary data, and the secondary data, the impact of herptiles is shown to be lesser, therefore giving agreement with my hypothesis the majority. However, Result 2 had more varied results. The first part of this specific hypothesis, **'reptiles and amphibians use more energy in buildings and homes when kept as pets than dogs and cats',** is proven incorrect, with commercial buildings actually using more energy when they care for dogs, but the second part, **'reptiles and amphibians use more energy in buildings and homes when kept as pets than dogs and cats'**, is proven correct, with herptiles using more energy overall in domestic settings (e.g. homes).

My secondary data was in agreement with my main hypothesis for the majority, too, with the exception of my data on Waxworms in Result 1, which showed a high amount of greenhouse gases from the production of Waxworms.

Given more time and resources, I believe that I could go a long way with this research project. Firstly, I could get larger sample sizes for all three of my results, to allow for greater representation of data. Also, in Result 2, extraneous variables such as staff using energy for personal usage, different energy providers, or just the overall size of the building with lighting, may make a difference, therefore the conclusion is not as statistically reliable as I feel it could have been, if I had more time. Furthermore, with more time, I could have gone into more detail with some of my data in Result 3, particularly in terms of figuring out an average amount of animals brought in by both the NCRW and the RSPCA, and made the data more comparable by calculating an estimate of how many might be brought in by each if they had a more similar organisation size, based on their populations, similar to 'per capita'. I could extrapolate some estimates for the NCRW, for example, because they are so much smaller.

As for some problems I encountered while completing this research project, I found that there were quite a few. Firstly, I had never done a research project before, so I needed help from my tutor to determine what format I should write my results in. Also, I did not get any responses to my questionnaire when I put it on Facebook groups, therefore I needed to send it to people I know personally to collect the data I needed. Another issue was that I didn't have an equal sample size of commercial and domestic data, which would have made my data more comparable and representative.

## CONCLUSION

In conclusion, my research project investigated the environmental impact of keeping herptiles as pets in contrast to keeping traditional companion animals as pets. A combination of primary and secondary data collection on pet food production processes, and their relation to greenhouse gas emissions, energy consumption averages throughout the UK, and reports of missing and released animals support my hypothesis that the keeping of reptiles and amphibians as pets has a lesser negative impact on the environment than that of traditional companion animals. In light of these results, concerns, from both online and in the media, should be taken with caution, as they may be misguided, and lack scientific evidence. Finally, this study should highlight the importance of conducting your own research on almost every topic, especially those which have caused controversy and discourse, and where statements made may be by people who have opinionated views, and biases, before reaching your own conclusions on exotic pet ownership.

## REFERENCES

**Result 1:**

1. A Survey among Dog and Cat Owners on Pet Food Storage and Preservation in the Households - PMC
2. How To Mix Feed Dogs and Cats of All Ages – Harringtons Pet Food
3. Study analyses environmental impacts of pet diets - BBC Newsround
4. https://www.sciencedirect.com/science/article/abs/pii/B9780443192319000077
5. 0animals'%20as,change%20in%20many%20different%20ways.
6. https://www.wwf.org.uk/press-release/insects-animal-feed-report
7. https://www.bbc.co.uk/news/world-europe-12216355#:~:text=Dutch%20scientist%20Arnold%20van%20Huis,such%20as%20Mexico%20and%20Thailand.
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11. https://sciencemediahub.eu/scientists/arnold-van-huis/#:~:text=Eating%20insects:%20'Good%20for%20your,the%20co%2Dauthors%20…
12. https://sciencemediahub.eu/2024/01/10/eating-insects-good-for-your-health-the-planet-and-nutritionally-equivalent-to-meat/

**Result 2:**

1. https://register-of-charities.charitycommission.gov.uk/en/charity-search/-/charity-details/203644/financial-history?_uk_gov_ccew_onereg_charitydetails_web_portlet_CharityDetailsPortlet_organisationNumber=203644
2. https://www.dogstrust.org.uk/downloads/Dogs_Trust_Sustainability_Report_2024_0.pdf
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5. https://www.housingenergyadvisor.com/blog/pets-cost-home-owners-78million-in-energy-bills/

**Result 3:**

1. https://register-of-charities.charitycommission.gov.uk/en/charity-search
2. https://www.rspca.org.uk/documents/d/rspca/annual_review_2023_web
3. https://www.rspca.org.uk/adviceandwelfare/wildlife#:~:text=We%20class%20'wild%2
4. https://rspca.sfo2.cdn.digitaloceanspaces.com/public/Uploads/annual-statistics/RSPCA-Report-on-Animal-Outcomes-2023-2024.pdf

## ANNEX

**Questionnaire Questions:**

What type of pet(s) do you have?*

- Commonly owned mammal (Dogs, Cats, Bunnies, Small Rodents etc.)
- Rarely owned mammal (Larger Rodents, Ferrets, Marsupials etc.)
- Small-Medium Reptile (Smaller Snakes, Lizards, Bearded Dragons, Geckos etc)
- Large Reptile (Larger Snakes, Monitors etc.)
- Amphibian
- Bird
- Other

How many pets do you have?*

- 1
- 2
- 3
- 4
- 5
- 10+
- 20+
- Other

How often do you feed your pet(s)?*

- One time a day
- Two times a day
- Three times a day
- Once every other day
- Once every three days
- Once every four days
- Once every five days
- Once every six days
- Once a week
- Once every two weeks
- Once every three weeks
- Once a month
- Once every two months
- Other

What type of food do you primarily feed your pet? (Along with fruit and vegetables, for example)

- Canned (Wet food)
- Dry (Kibble)
- Raw Meat
- Grain/Seeds
- Whole Meat (Rodents etc.)

- Other

For the final question, please state how strongly you agree with the following statement.

I worry about the carbon footprint/environmental impact of feeding my pet.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
- Other

**Standard Deviation Calculations:**

Annual Carbon Footprint

| Domestic Exotic | Traditional | Commercial Exotic | Traditional |
|---|---|---|---|
| 2013.98 | 1433.74 | 4050.5 | 80785.4 |
| 1216.12 | 2700 | 3584.9 | |
| 2861.14 | | 6426.4 | |
| | | 5185.5 | |
| | | 2714.6 | |

| | Domestic Exotic | Domestic Traditional | Commercial Exotic | Commercial Traditional |
|---|---|---|---|---|
| Average | 2030.413 | 2066.87 | 4687.267 | 80785.4 |
| SD | 671.6771 | 633.13 | 1297.89 | 0 |

Log10 Transformation

| Domestic Exotic | Traditional | Commercial Exotic | Traditional |
|---|---|---|---|
| 3.304055 | 3.15647 | 3.607509 | 4.907333 |
| 3.084976 | 3.431364 | 3.554477 | |
| 3.456539 | | 3.807968 | |
| | | 3.714791 | |
| | | 3.433706 | |

| | Domestic Exotic | Domestic Traditional | Commercial Exotic | Commercial Traditional |
|---|---|---|---|---|
| SD | 0.186773 | 0.194379 | 0.144399 | 0 |