



How can we  
get closer to  
net-zero  
without  
compromising  
other  
sustainability  
metrics?

*27<sup>th</sup> February 2023*

Source: Jude L. Capper, 2023

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# There is no definitive sustainable protein system – but every system can be sustainable

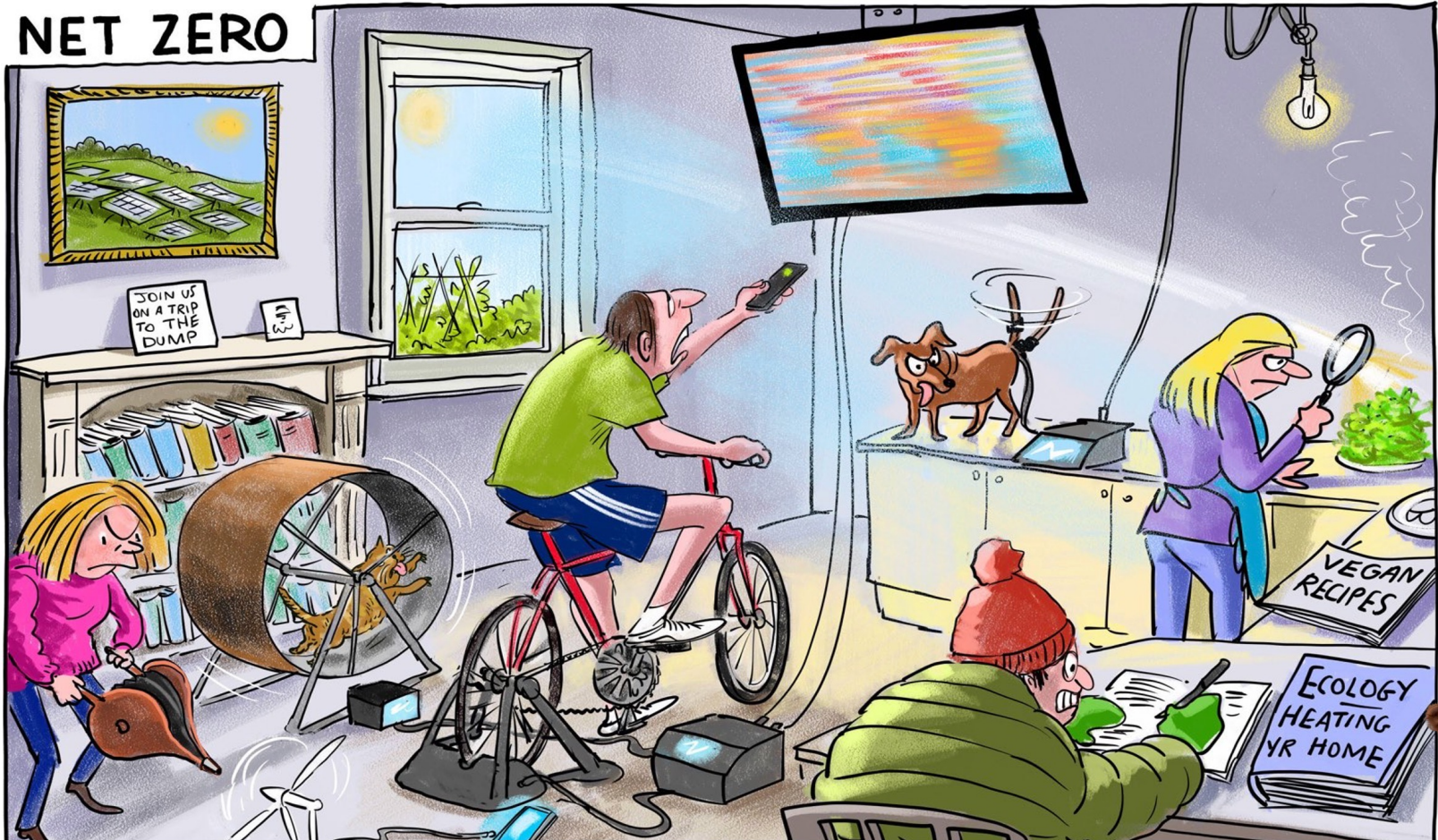


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Source: Created and photos by Dr. Jude L. Cappier, 2020

# Net Zero is a clear priority



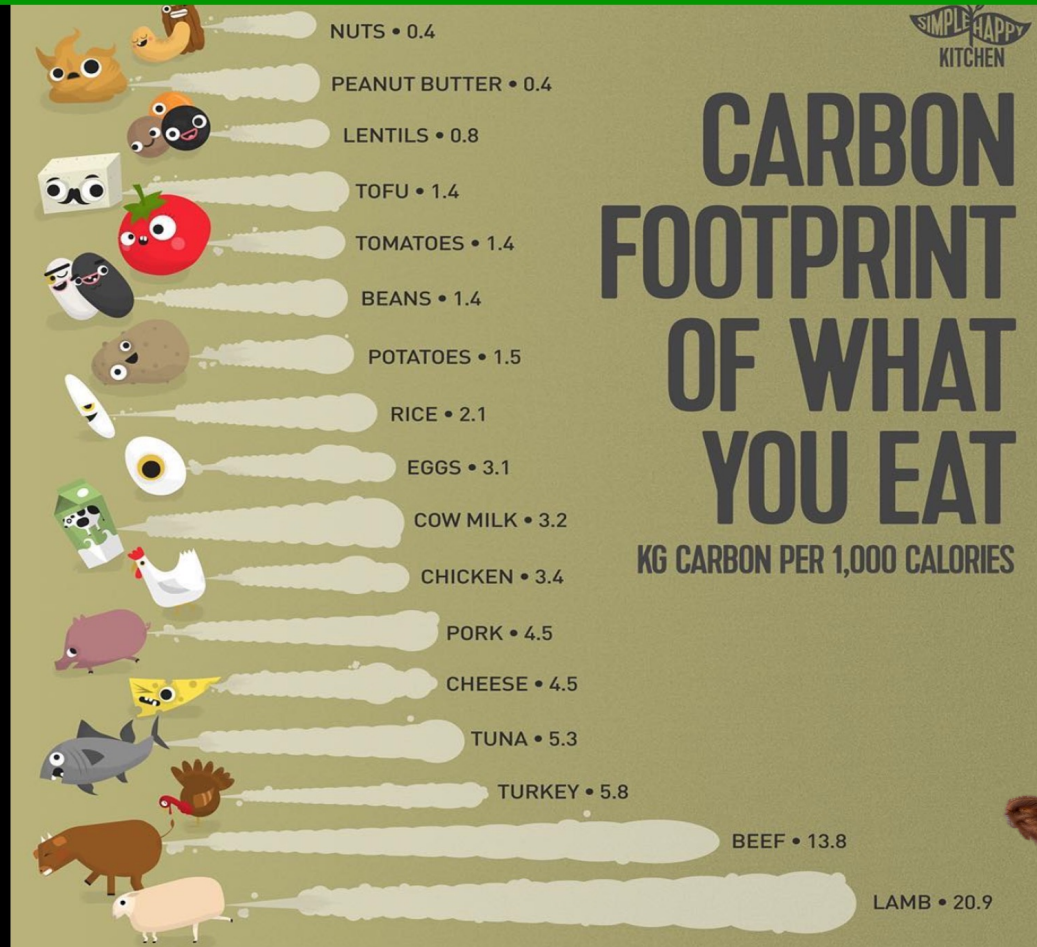
Source: Created by Dr. Jude L. Capper, 2021. Cartoon from: <https://twitter.com/Cartoon4sale/status/1384537729460056067?s=20>



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# Global averages are meaningless

The carbon footprints of the foods we eat vary considerably – global average figures are inappropriate when food production is regional



Source: Created by Dr. Jude L. Capper, 2020, infographic from: [https://www.instagram.com/simple\\_happy\\_kitchen/](https://www.instagram.com/simple_happy_kitchen/)

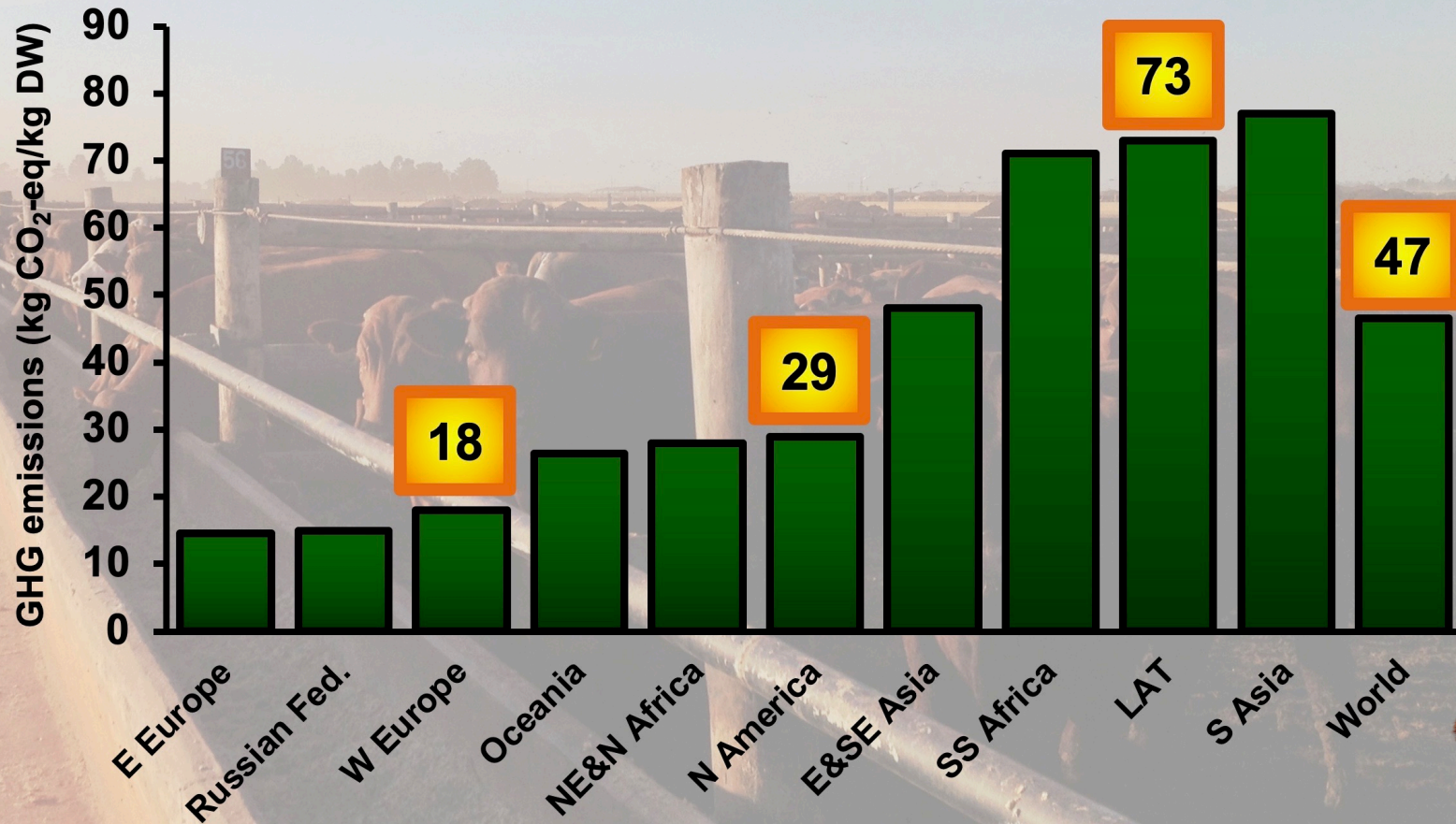


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# The carbon footprint of beef production varies across the globe

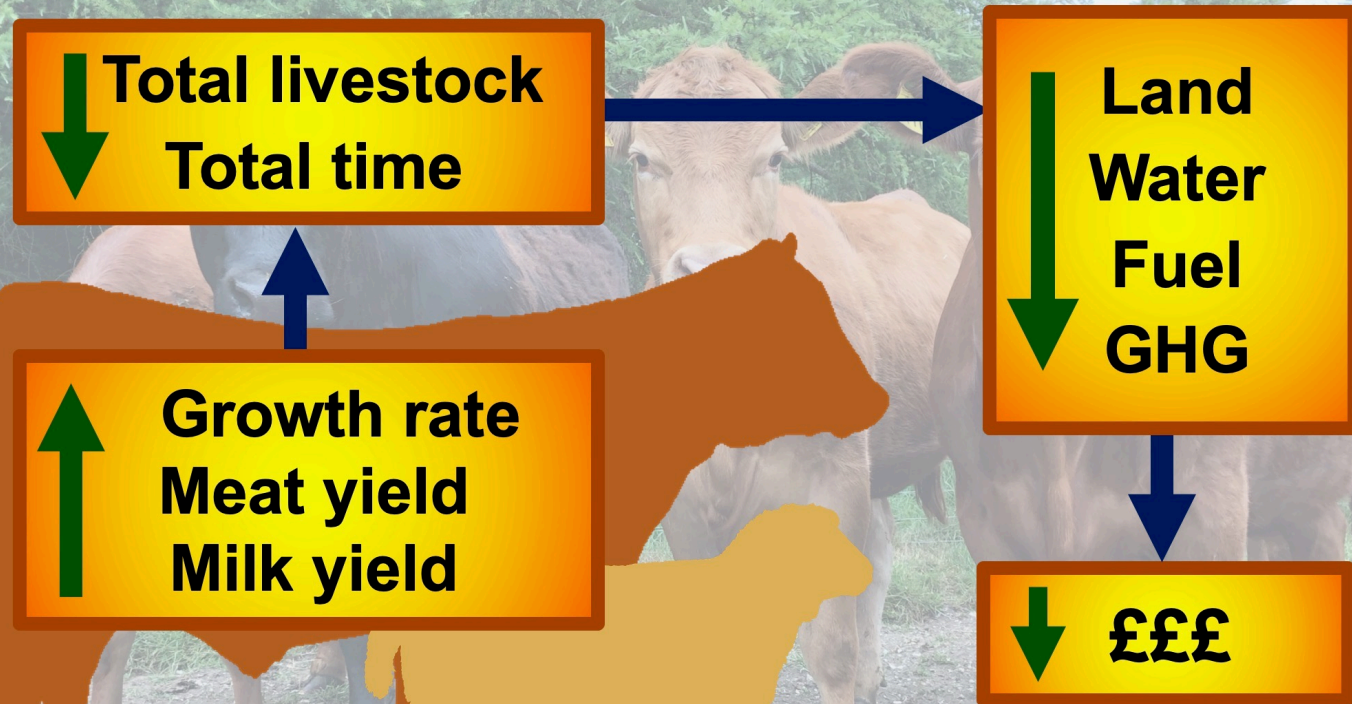


Source: Created by Dr. Jude L. Capper, 2020; data from Gerber et al. (2013) Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. FAO, Rome, Italy.



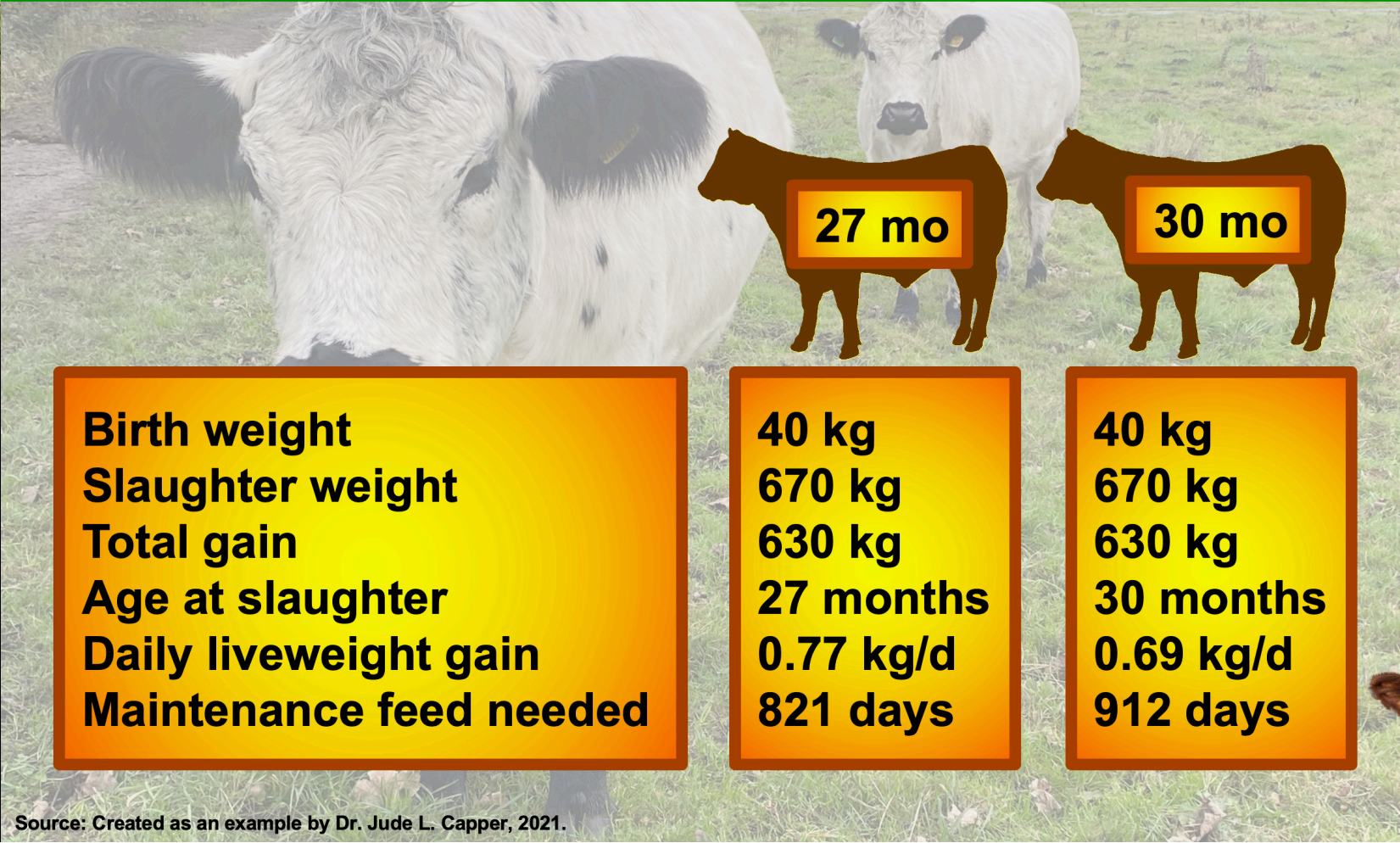
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# Improving animal productivity reduces the environmental impact of milk and meat



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# Reducing age at slaughter has both economic and environmental benefits



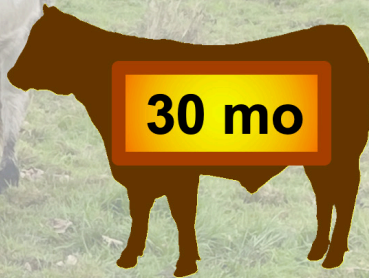
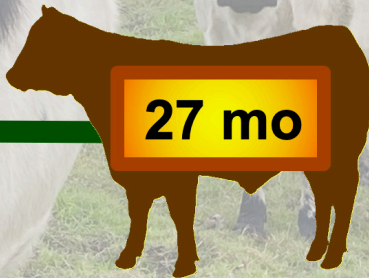
Source: Created as an example by Dr. Jude L. Capper, 2021.



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# Reducing age at slaughter has both economic and environmental benefits

91 fewer days of feed, land and greenhouse gases. Opportunity cost?



Birth weight
Slaughter weight
Total gain
Age at slaughter
Daily liveweight gain
Maintenance feed needed

40 kg
670 kg
630 kg
27 months
0.77 kg/d
821 days

40 kg
670 kg
630 kg
30 months
0.69 kg/d
912 days



Source: Created as an example by Dr. Jude L. Capper, 2021.



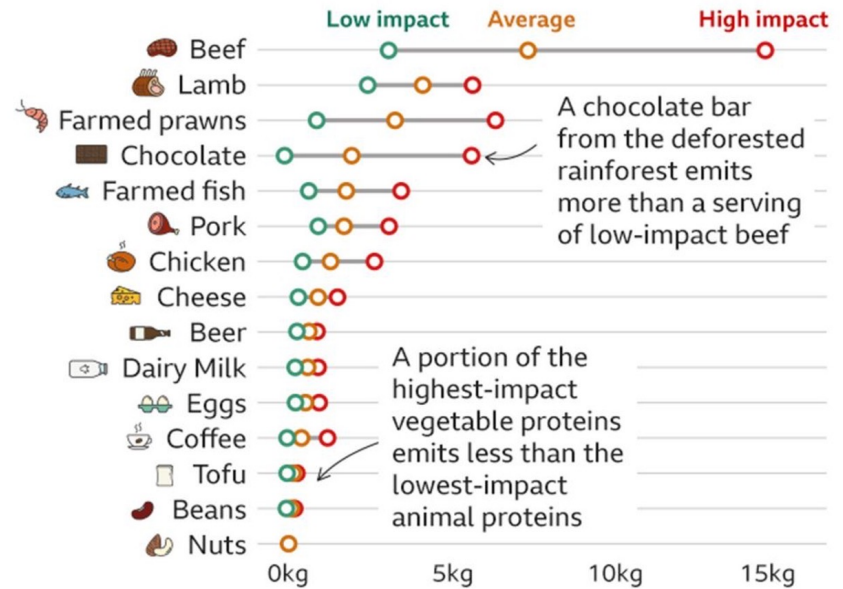


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# Sleep have rather slipped under the radar re: environmental sustainability



Beef has the biggest carbon footprint – but the same food can have a range of impacts  
Kilograms of greenhouse gas emissions per serving



Note: The figures for each food are based on calculations using data from 119 countries. Serving sizes are from the British Dietetic Association (BDA) and Bupa.

Source: Poore & Nemecek (2018), Science



Source: Created by Dr. Jude L. Capper, 2021. Infographic from Poore and Nemecek via the BBC: <https://www.bbc.co.uk/news/explainers-59232599>



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# Animals, manure and cropping are hotspots for sheep GHG emissions



Animals: 45%



Manure: 36%



Crop inputs: 11%



Feed: 7%



Other: 1%



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# Major sustainability challenge for the sheep industry – keeping lambs alive



Source: Created by Dr. Jude L. Capper, 2021



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## Data is sparse, but some key opportunities highlighted to decrease GHG



**Finish lambs earlier = 16-24%**



**Lamb ewes as hoggets = 9-13%**



**Select for low methane = 8-10%**



**Select for litter size = 5-9%**



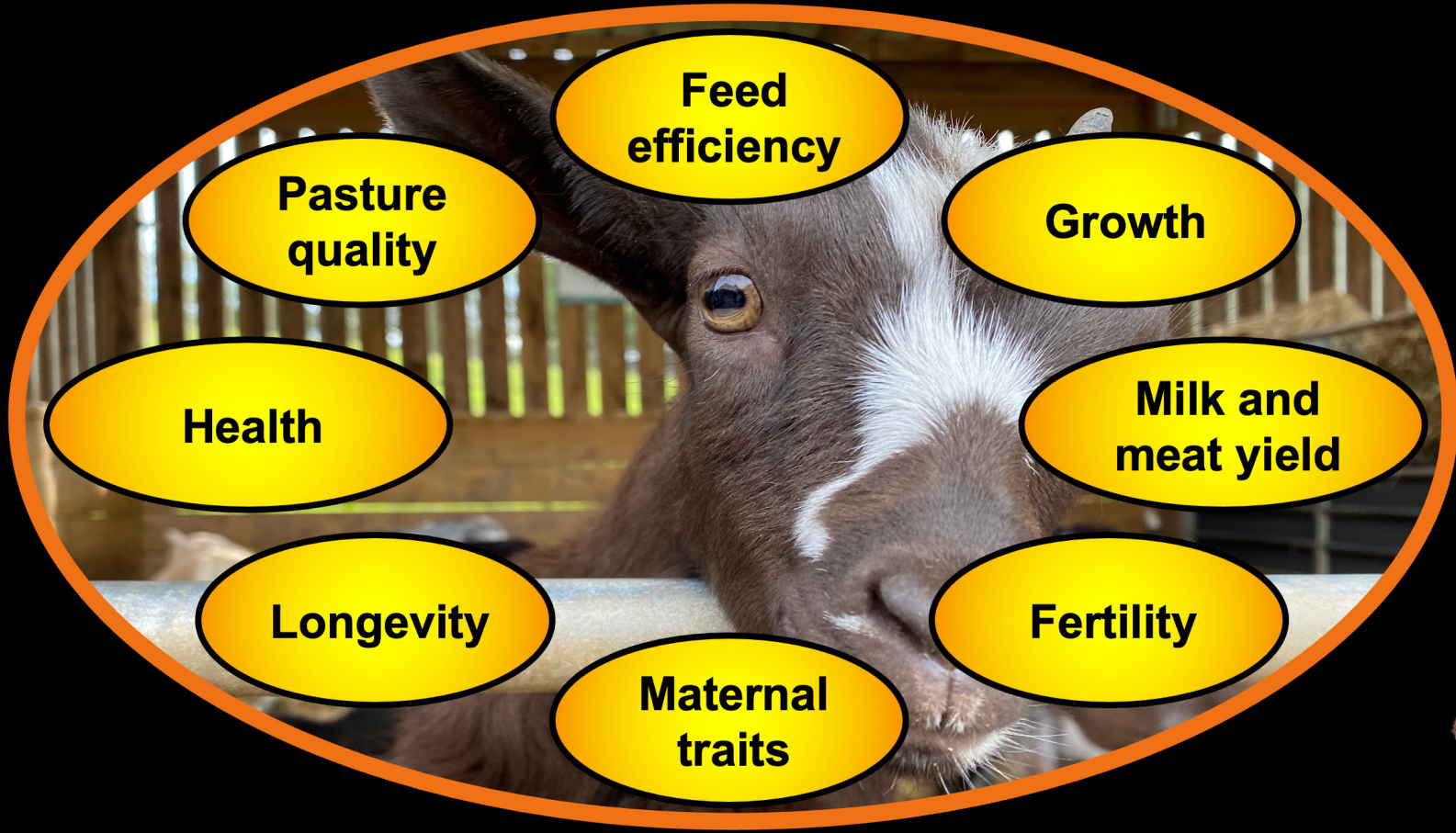
**Improve ewe longevity = 1-6%**

**Note:  
Results  
are from  
multiple  
studies**



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# Improving key performance indicators reduces environmental impacts



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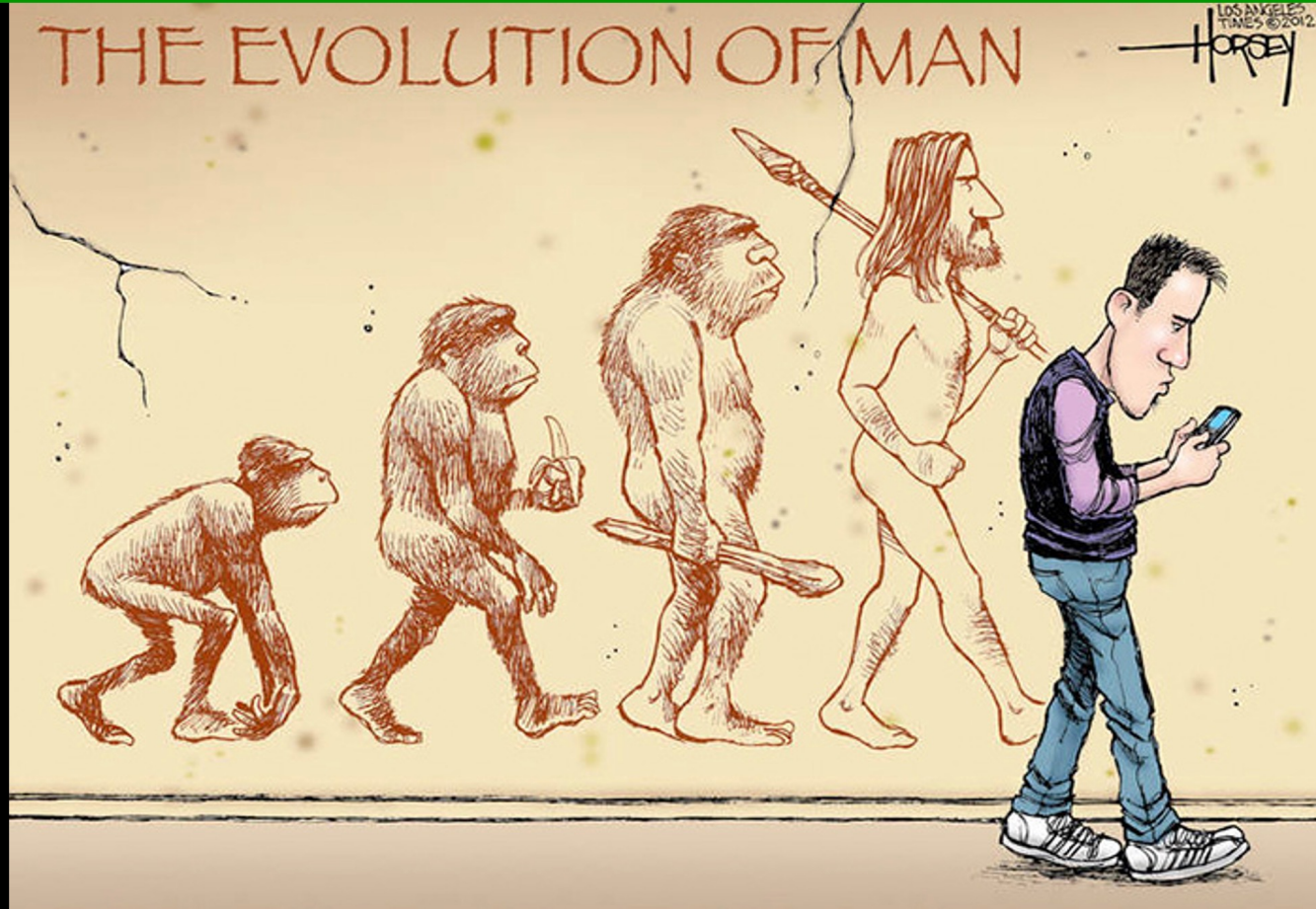


Source: Created by Dr. Jude L. Capper, 2021



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We've got the technology –  
now we need to use it to its potential



Source: Created by Dr. Jude L. Capper, 2021. Cartoon from: [https://static.boredpanda.com/blog/wp-content/uploads/2016/02/funny-satirical-evolution-charles-darwin-day-251\\_700.jpg](https://static.boredpanda.com/blog/wp-content/uploads/2016/02/funny-satirical-evolution-charles-darwin-day-251_700.jpg)

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# Retailers face challenge of meeting net zero commitments

**50% reduction** in food-related GHG emissions by 2030 is possible, but only if we take

**URGENT**  
**ACTION**

[wrap.org.uk/GHGPathway](https://wrap.org.uk/GHGPathway)



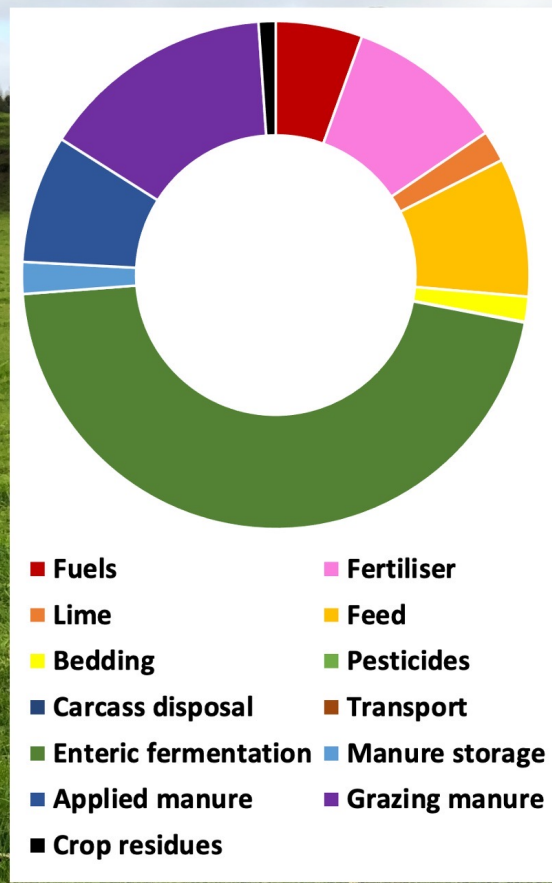
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Source: Created by Dr. Jude L. Capper, 2021. Infographic from: [https://wrap.org.uk/sites/default/files/2021-10/WRAP\\_UK\\_food%20systems\\_GHG\\_Report\\_TWITTER\\_Urgent%20action.jpg?itok=8txblEnz](https://wrap.org.uk/sites/default/files/2021-10/WRAP_UK_food%20systems_GHG_Report_TWITTER_Urgent%20action.jpg?itok=8txblEnz)

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# Standard footprinting tool urgently needed across the industry



Source: Created by Dr. Jude L. Capper, 2021. Example carbon footprint results based on a beef finishing farm.

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## GHG benefits of dairy-beef now recognized – sucklers will need to demonstrate benefits

### Annual requirements of one suckler cow:

- 3,954 kg feed DM
- 20,047 litres water
- 2,459 kg CO<sub>2</sub>

Need to justify these impacts vs. beef from dairy.



Source: Created by Dr. Jude L. Capper, 2021. Calculation based on feed and water requirements of one Angus cow weighing 544 kg producing 7.8 kg of milk per day, with calf weaned at 207 days of age.



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# Can we grow human food crops everywhere?



Source: Created by Dr. Jude L. Capper, 2021

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# Can we grow human food crops everywhere?



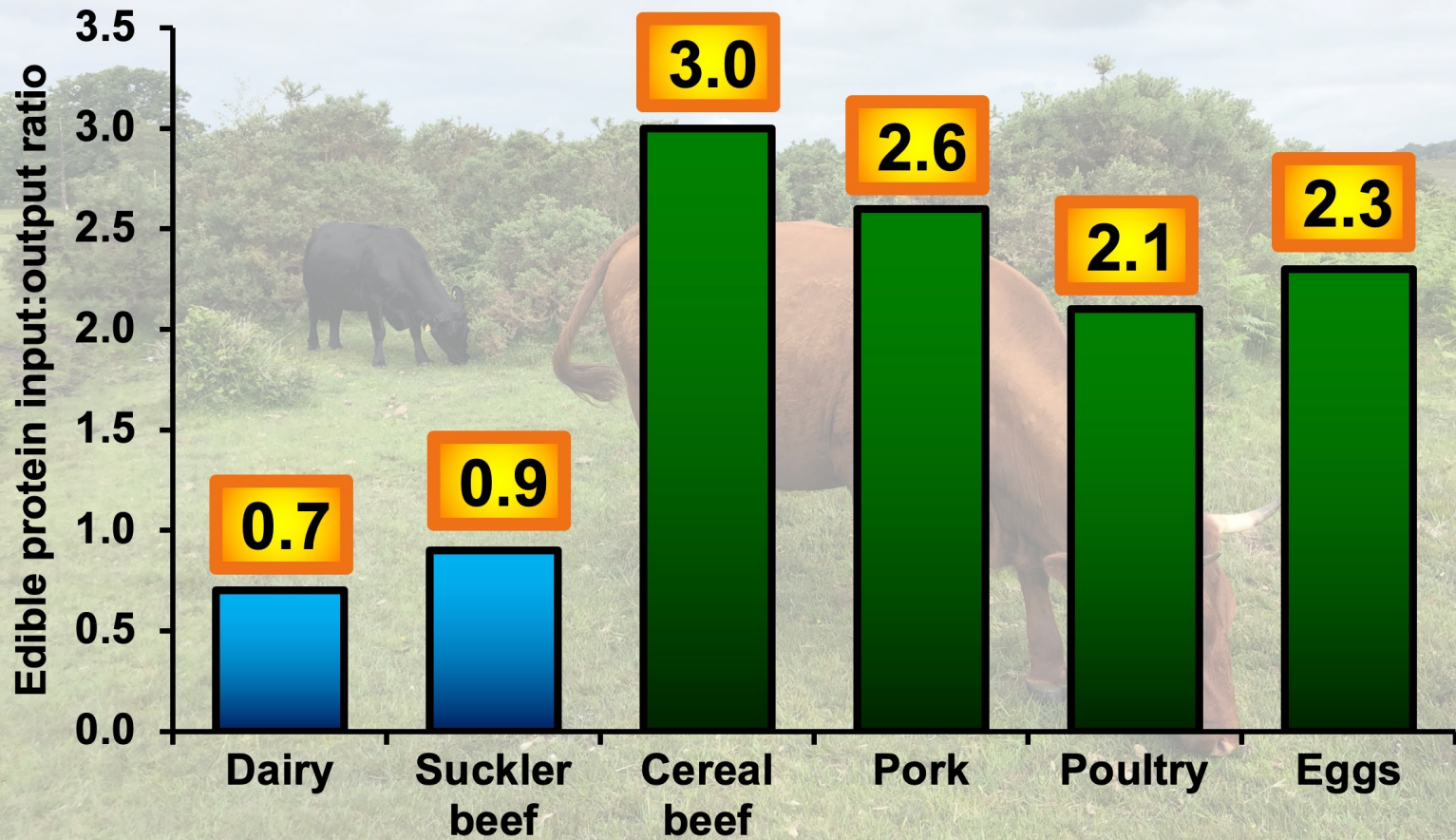
Source: Created by Dr. Jude L. Capper, 2021

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# Grazing cattle systems produce more human-edible protein than they consume



Source: Created by Dr. Jude L. Capper, 2020; data from Wilkinson (2011) Re-defining efficiency of feed use by livestock. *Animal*.



AH

Disease losses are significant and preventable, but the sustainability impacts aren't quantified

Lost: 20%

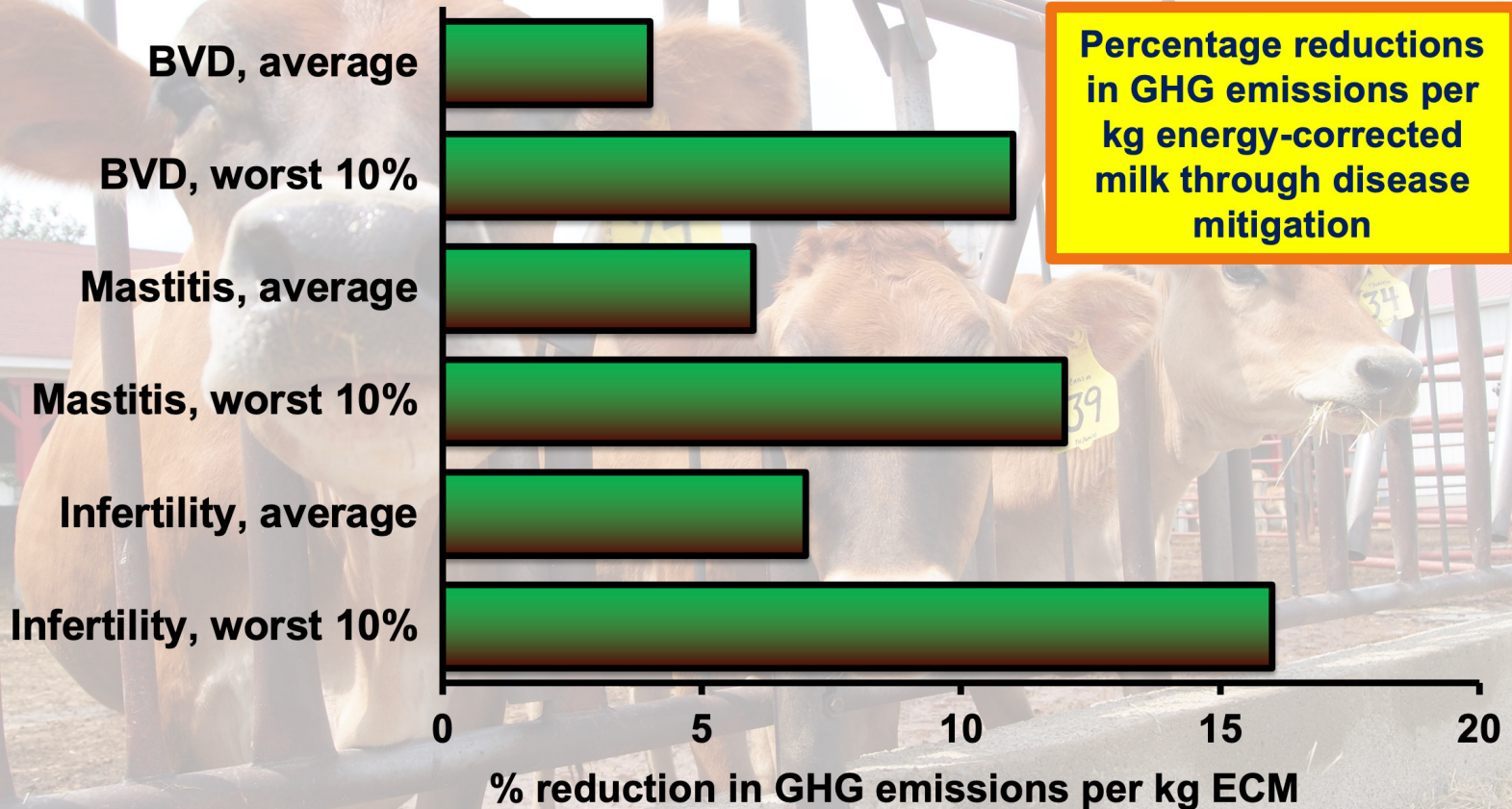
Harvested: 80%

At the worldwide level, average losses due to animal diseases are more than 20% (OIE, 2008)



DS

# GHG emissions could be cut significantly by mitigating dairy diseases - UK

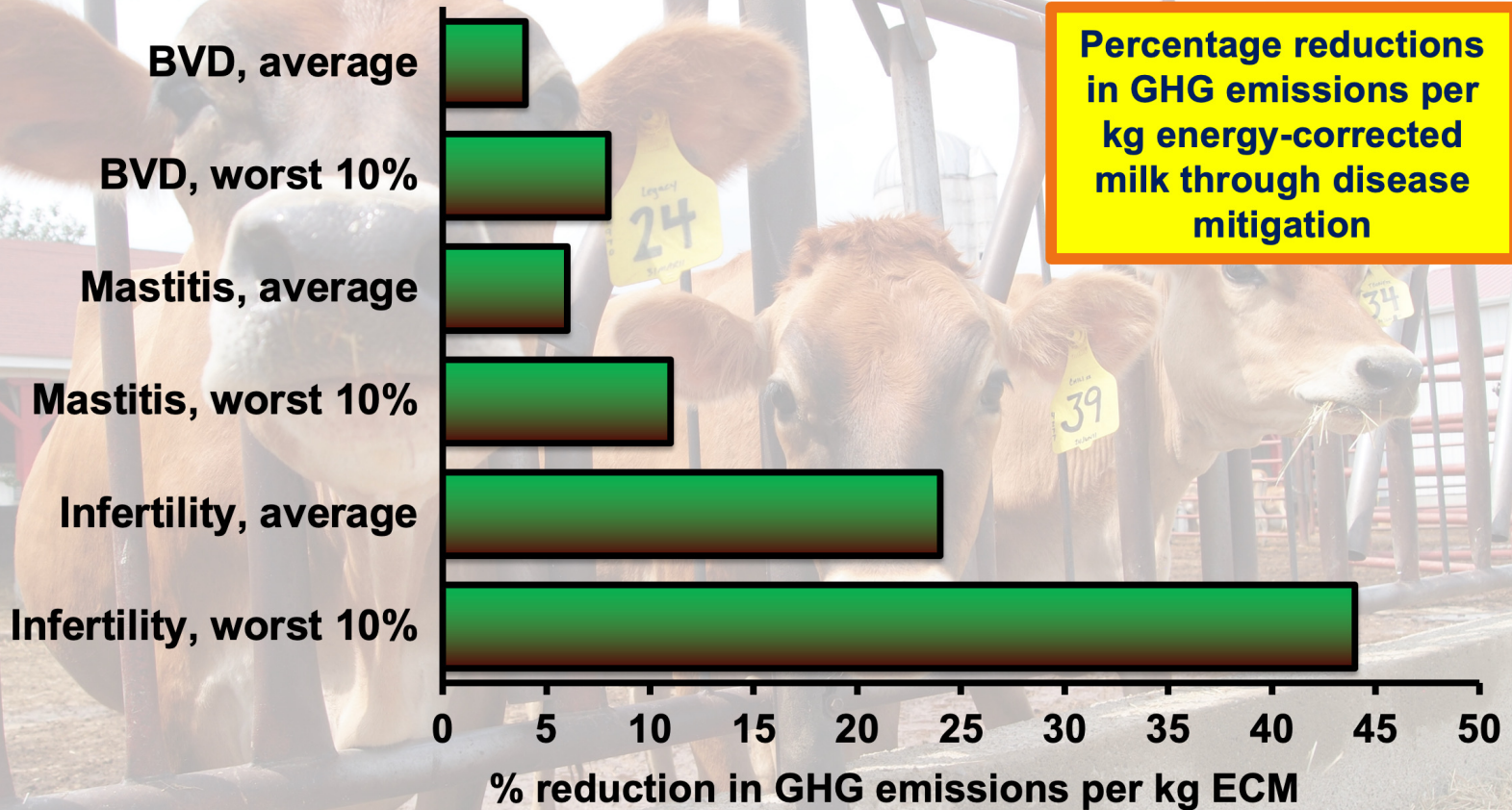


Source: Created by Dr. Jude L. Capper, 2021. Data from: Statham et al. 2021. Dairy Cattle Health and Greenhouse Gas Emissions Pilot Study: Chile, Kenya and the UK. Available from: <https://dairysustainabilityframework.org/wp-content/uploads/2020/10/Dairy-Cattle-Health-and-GHG-Emissions-Pilot-Study-Report.pdf>



DS

# GHG emissions could be cut significantly by mitigating dairy diseases - Kenya



Source: Created by Dr. Jude L. Capper, 2021. Data from: Statham et al. 2021. Dairy Cattle Health and Greenhouse Gas Emissions Pilot Study: Chile, Kenya and the UK. Available from: <https://dairysustainabilityframework.org/wp-content/uploads/2020/10/Dairy-Cattle-Health-and-GHG-Emissions-Pilot-Study-Report.pdf>





D

What could global dairying look like if we improved health, nutrition and genetics?

Global average yield

2,577  
kg

UK average yield

8,140  
kg

Dairy cows

-181  
million

If all dairy cattle had UK yields, global milk supply could be maintained using 181 million fewer cows (69%).

At US average yields, 200 million fewer cows (75%)



D

# What about smallholders?



Source: Created by Dr. Jude L. Capper, 2021. Photo attribution: Mullokkaran, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>, via Wikimedia Commons

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## Livestock are a vital resource in developing regions



"For me, Send a Cow is everything"

Source: Created by Dr. Jude L. Capper, 2021. Photo from Send a Cow (2018) <https://www.sendacow.org/blog/for-me-send-a-cow-is-everything>



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## Livestock are a vital resource in developing regions

**“I started secondary school without a petticoat; that cow bought me my first petticoat. I cannot forget that.”**

**"For me, Send a Cow is everything"**

Source: Created by Dr. Jude L. Capper, 2021. Photo from Send a Cow (2018) <https://www.sendacow.org/blog/for-me-send-a-cow-is-everything>



S

# How do we account for myriad livestock benefits in sustainability metrics?



**Nutrition**



**Income**



**Fertiliser**



**Draught power**



**Cultural status**



**Education**



**Female emancipation**



Source: Created by Dr. Jude L. Capper, 2021.

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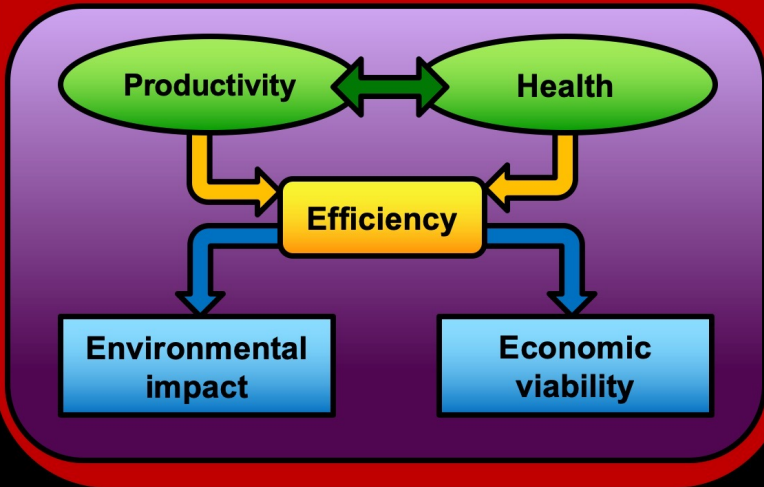


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# Social acceptability and consumer trust are vital for sustainable livestock production



## Social Acceptability



## Sustainability



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# Guilt is a primary motivator for people considering going vegetarian or vegan

*"I sometimes feel guilty when consuming meat and dairy products"*

**66% of meat-eaters and flexitarians thinking of giving up meat said "yes" compared to 25% of national population**

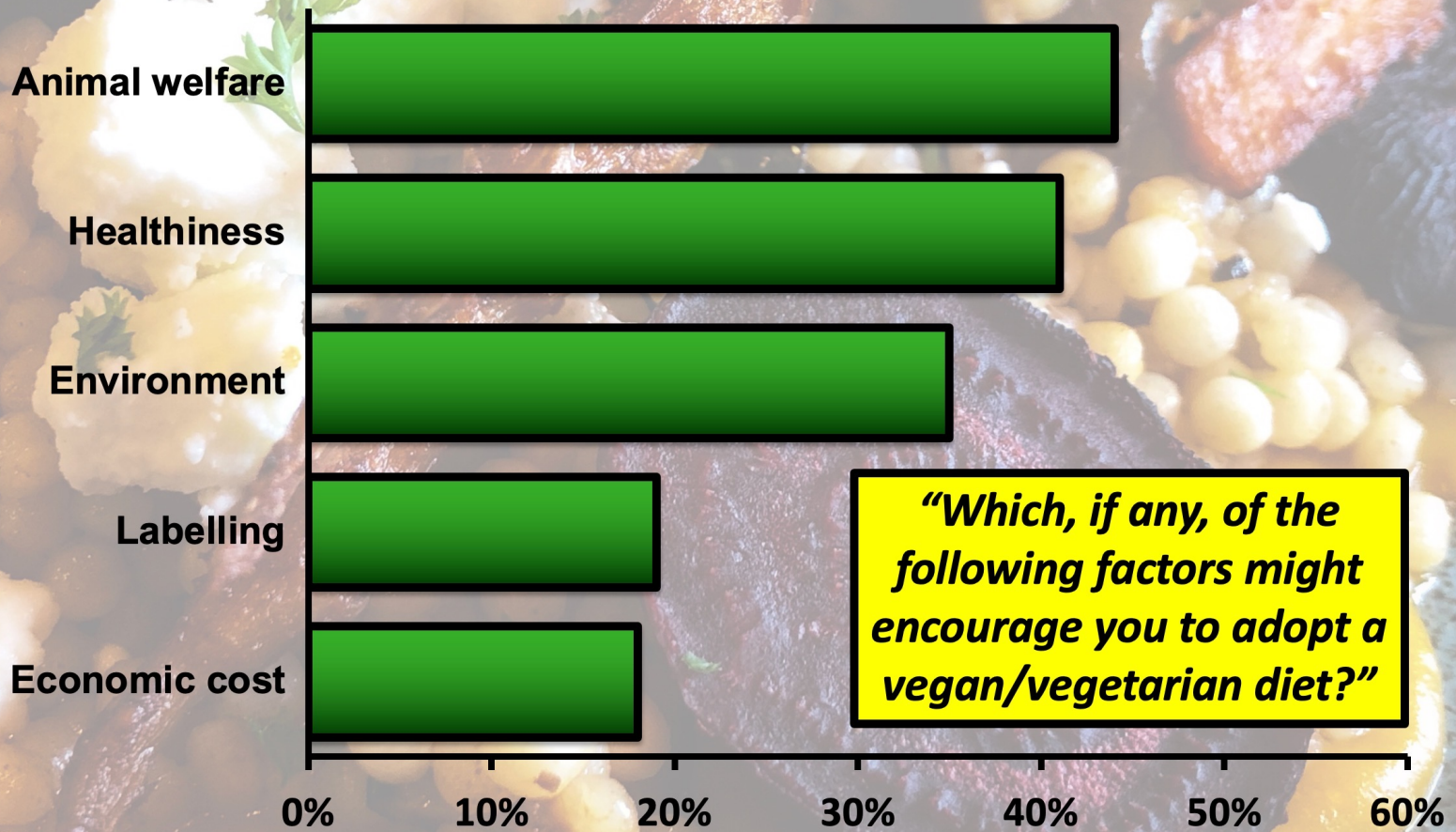
**No guilt  
34%**

**Feel guilty  
66%**



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# Animal welfare and human health are major concerns for people giving up animal products



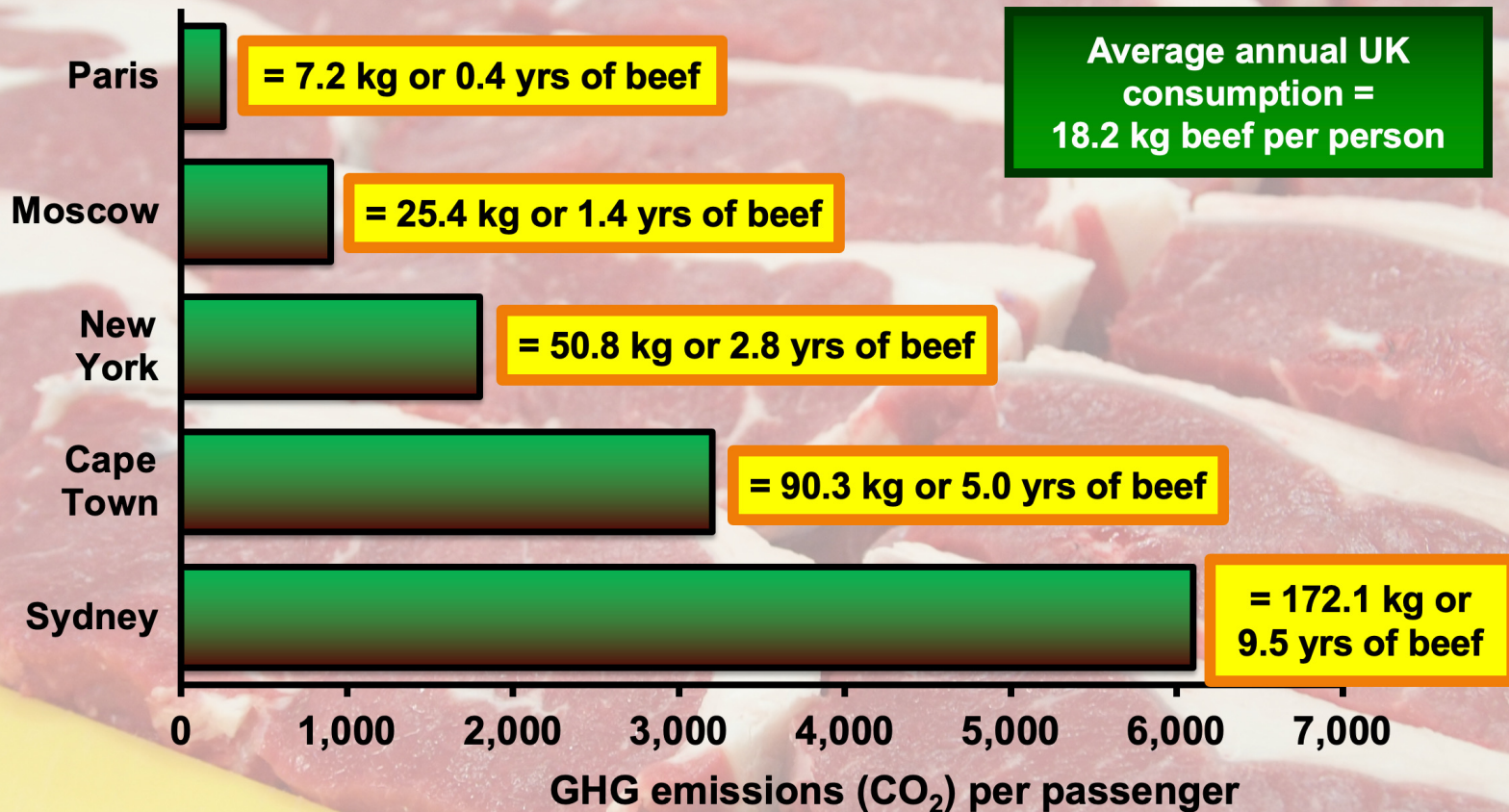
Source: Created by Dr. Jude L. Capper, 2020. Information from: YouGov (2019) Is the future of food flexitarian?  
<https://yougov.co.uk/topics/resources/articles-reports/2019/03/18/future-food-flexitarian>





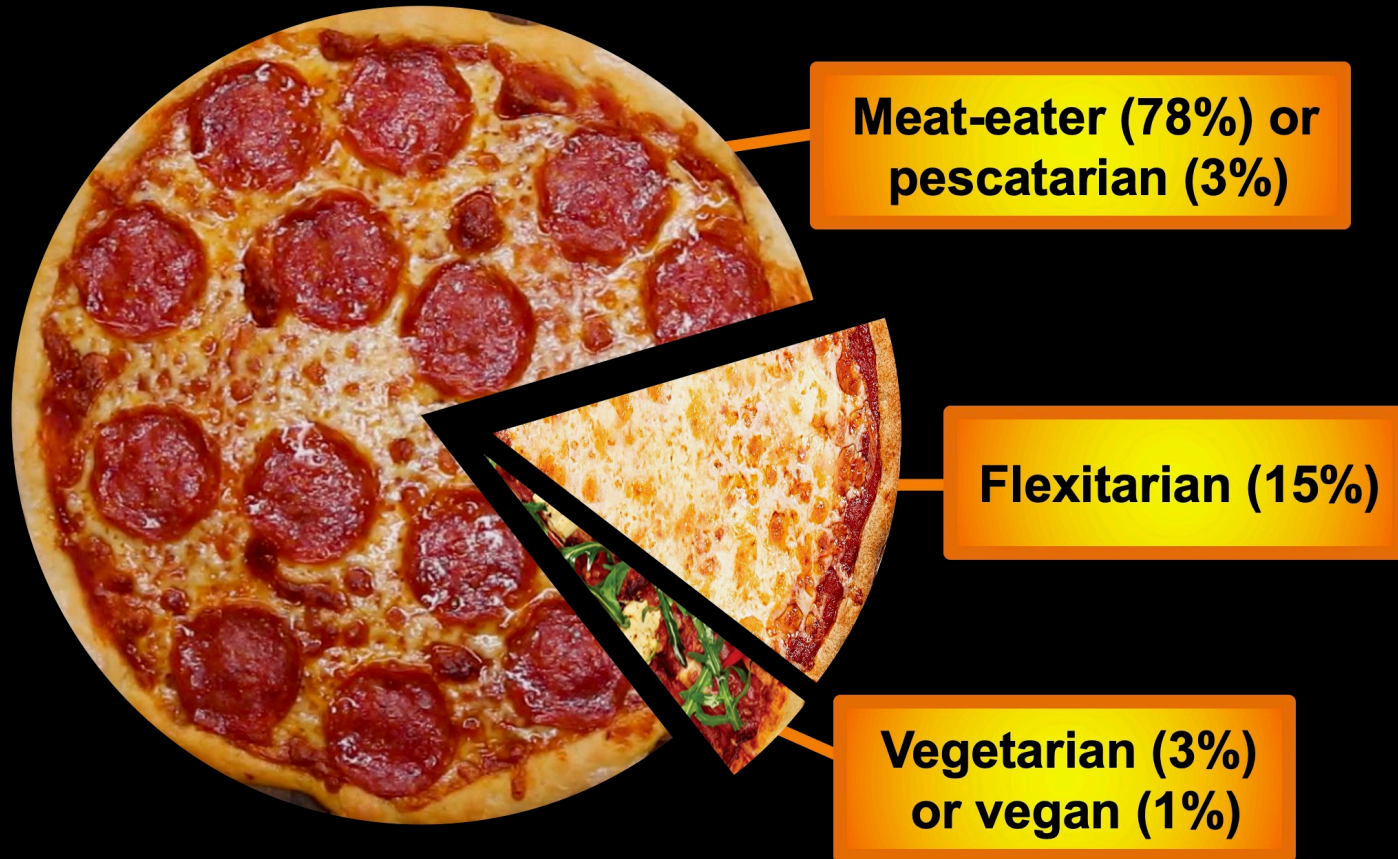
cv

# International flights emit considerable quantities of carbon compared to beef production



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# The future probably isn't vegan, but it may be flexitarian?



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Source: Created by Dr. Jude L. Capper, 2020. Data from: YouGov (2019) Is the future of food flexitarian?  
<https://yougov.co.uk/topics/resources/articles-reports/2019/03/18/future-food-flexitarian> Question: "Which, if any, of these best describes your usual eating habits?" Results adjusted for people who answered "don't know" (3%) or "other" (3%).

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# How do we make meat sexy?



Source: Created by Dr. Jude L. Capper, 2022.

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# How do we make meat sexy?



Source: Created by Dr. Jude L. Capper, 2022.



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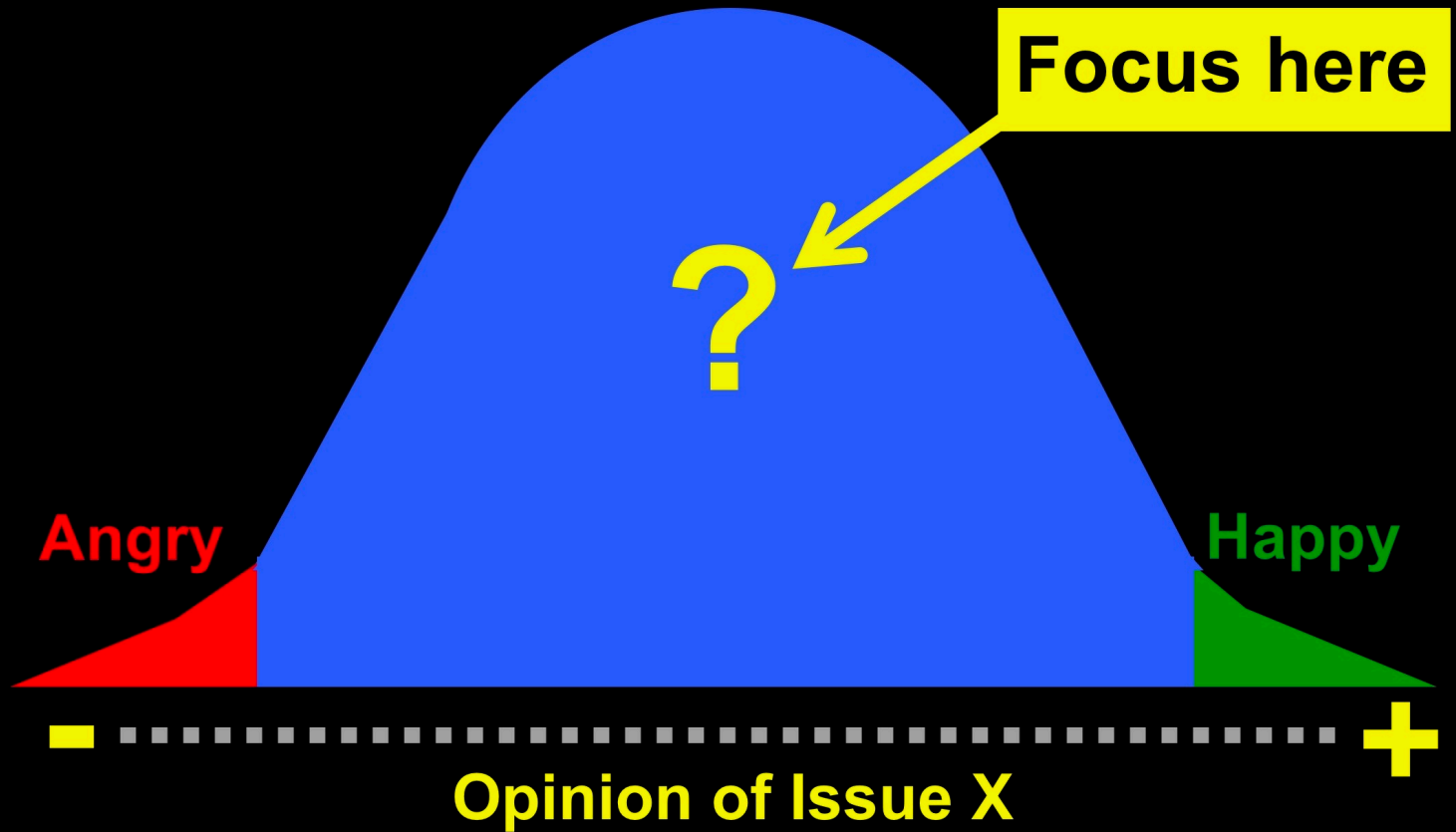
Source: Created by Dr. Jude L. Capper, 2022.

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We need to communicate with consumers who don't yet have fixed opinions of agriculture



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Source: Created by Dr. Jude L. Capper, 2017



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## 5 easy tips for positive communication

**Share your values**

**Stay positive, polite and personal**

**Keep it short, simple and see-through**

**Focus on the important**

**Know when to walk away**

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Source: Created by Dr. Jude L. Capper, 2019. Adapted from: Capper and Yancey. 2015. Communicating Animal Science to the General Public. *Animal Frontiers*.



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You don't have to be the biggest,  
you do need to do your best



Source: Created by Dr. Jude L. Capper, 2021.

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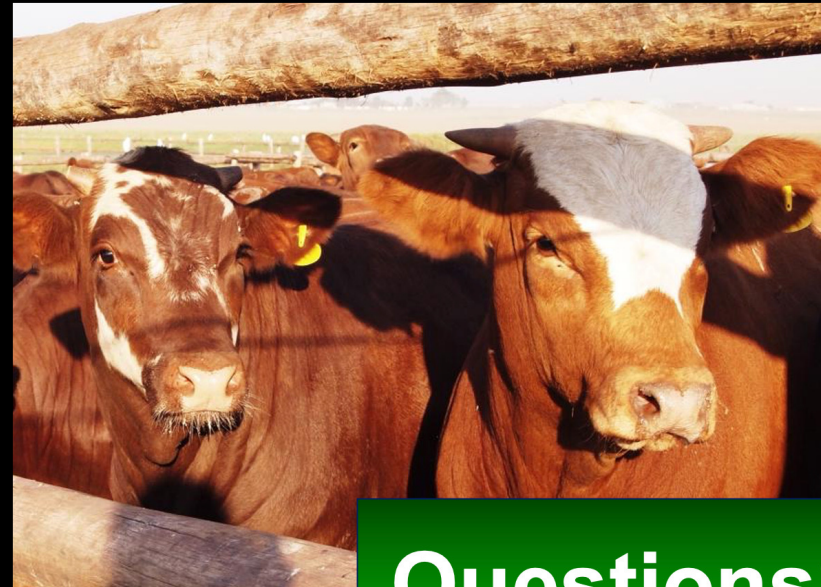


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# Thank you!

Jcapper@Harper-Adams.ac.uk  
<http://bovidiva.com/presentationlinks>

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## Questions?



Source: Created by Dr. Jude L. Capper, 2021. Cartoon from: <http://RubesCartoons.com>