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Sustainable and Responsible Beef Production using Growth Enhancing Technologies

3rd August 2023

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Source: Jude L. Capper, 2023

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s

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









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

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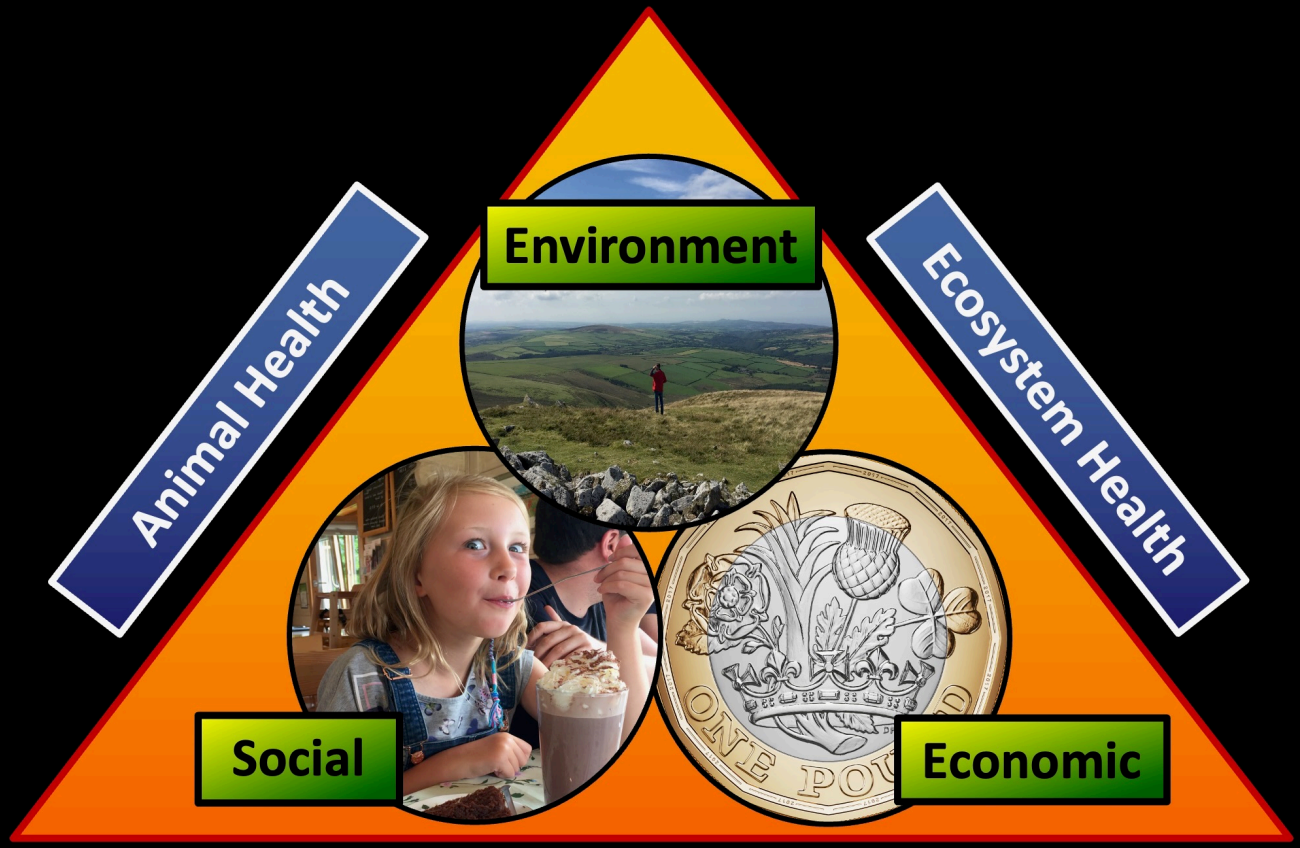
S

Sustainability comprises three pillars, all under the umbrella of One Health



Source: Created by Jude L. Capper, 2023.

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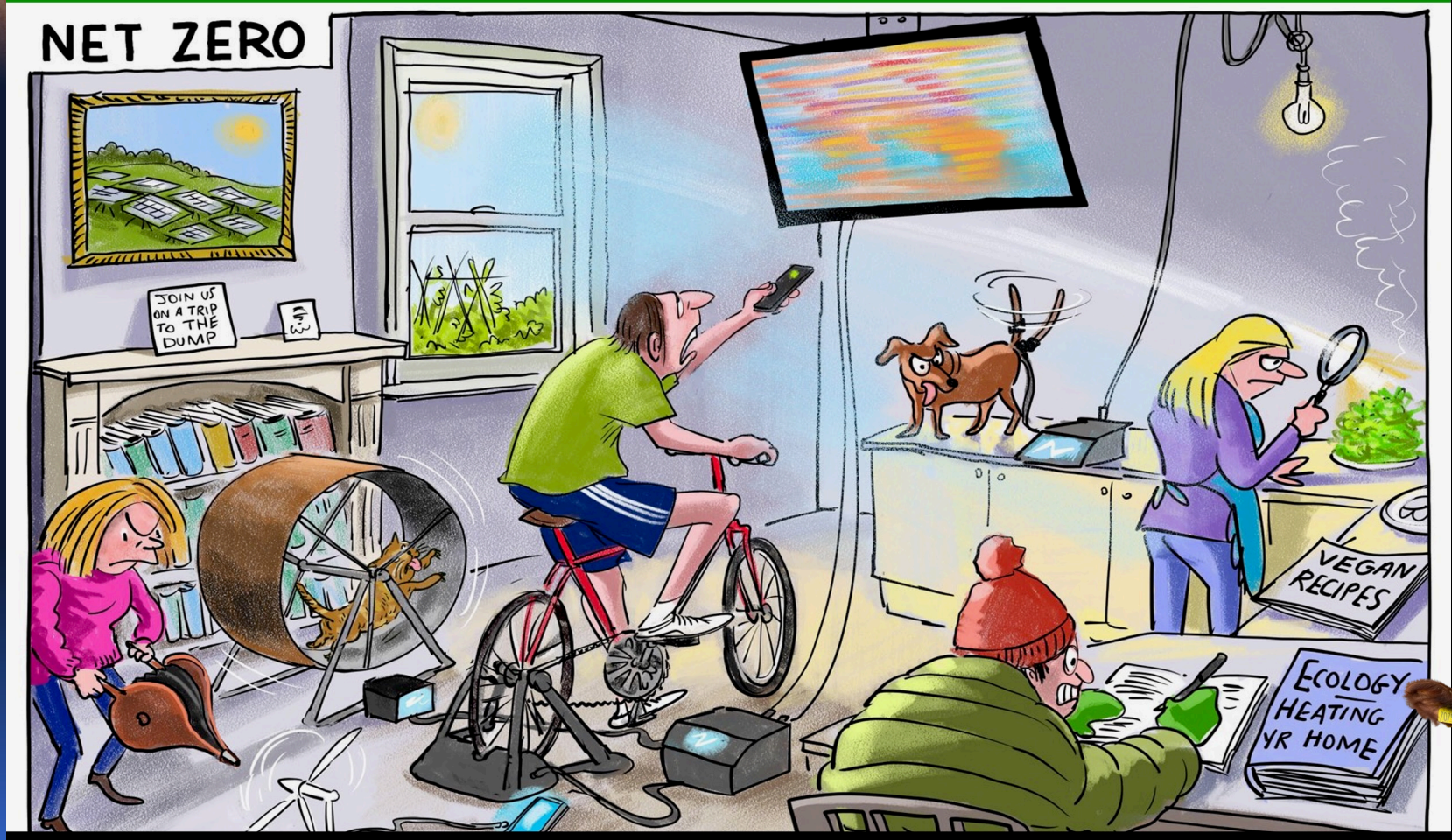
Net Zero is a clear priority



Source: Created by Jude L. Capper, 2023. Cartoon from: https://twitter.com/Cartoon4sale/status/1384537729460056067?s=20

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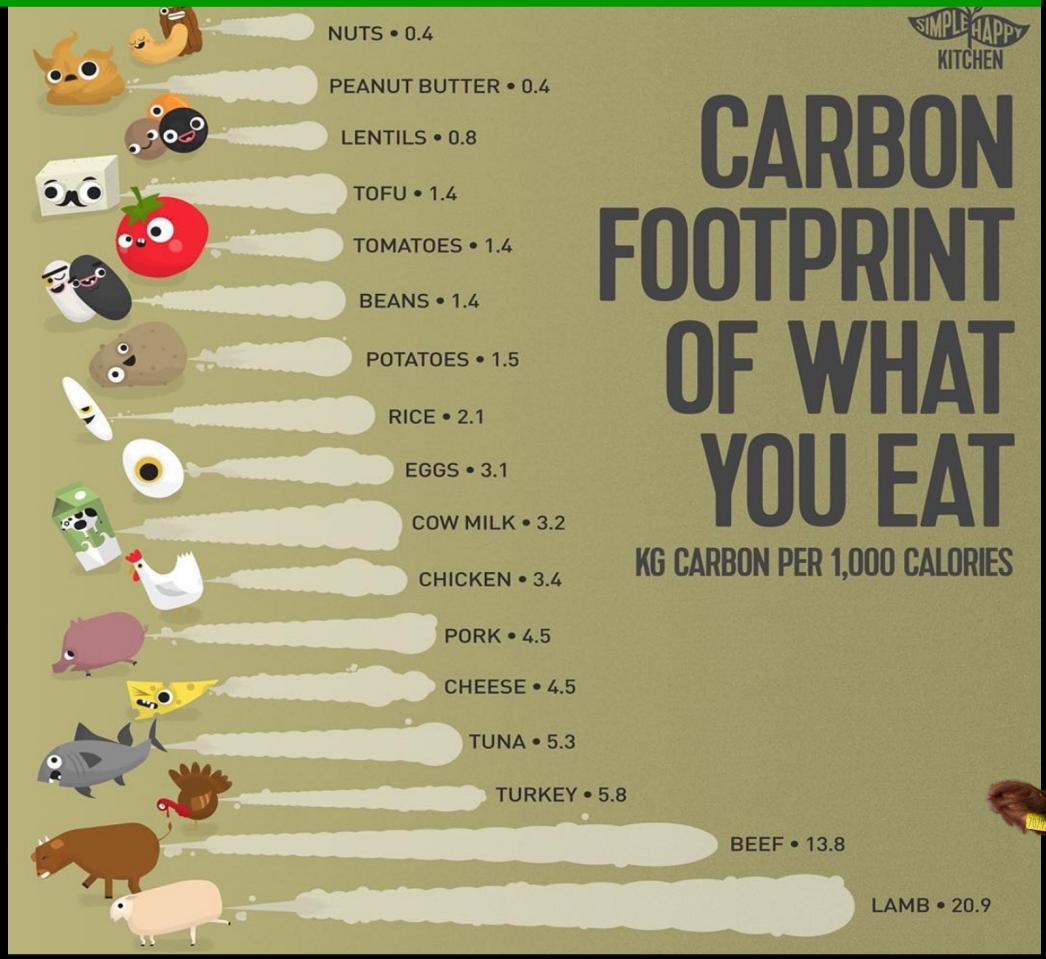
B

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 Jude L. Capper, 2023. Infographic from https://www.instagram.com/simple_happy_kitchen/

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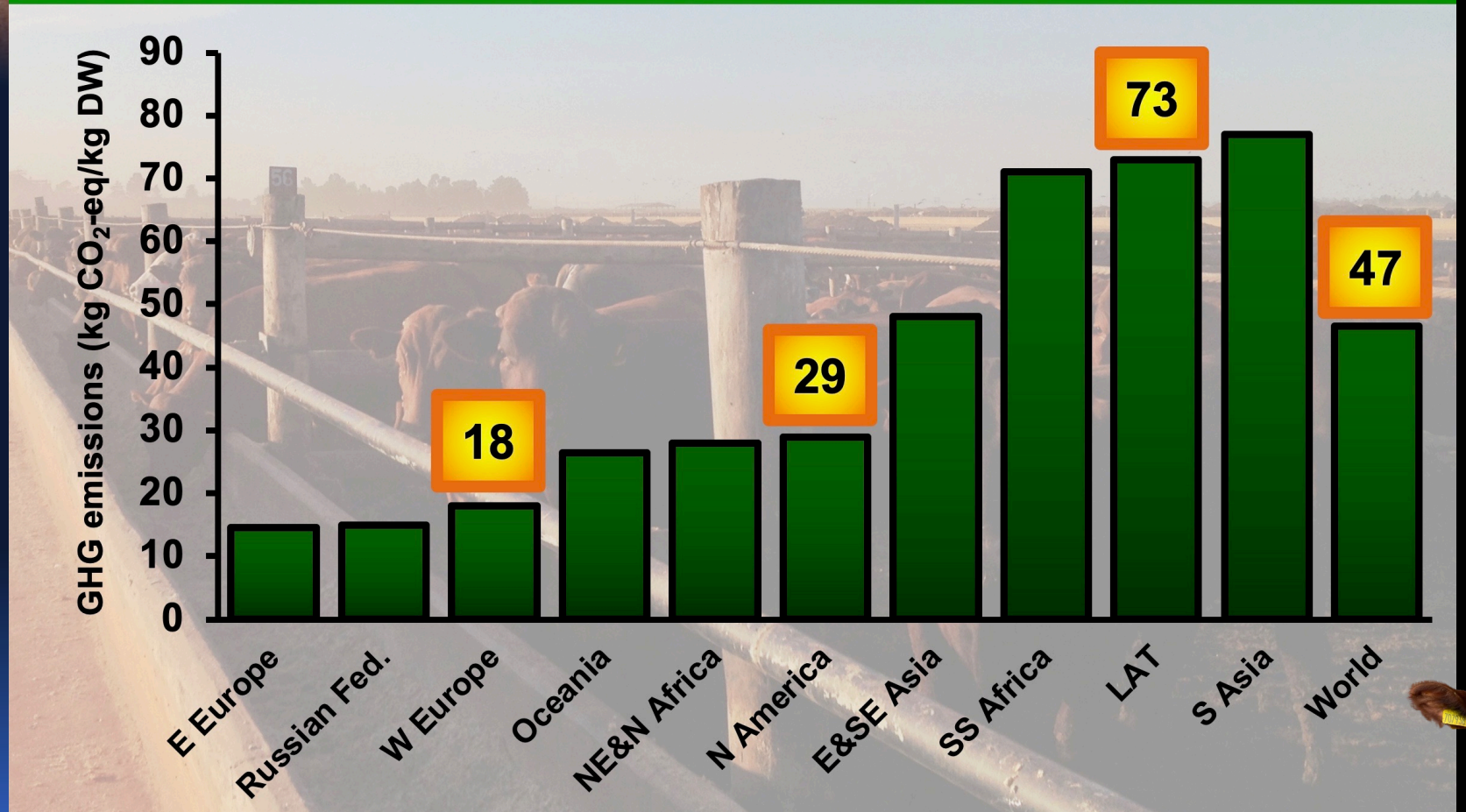
The carbon footprint of beef production varies across the globe



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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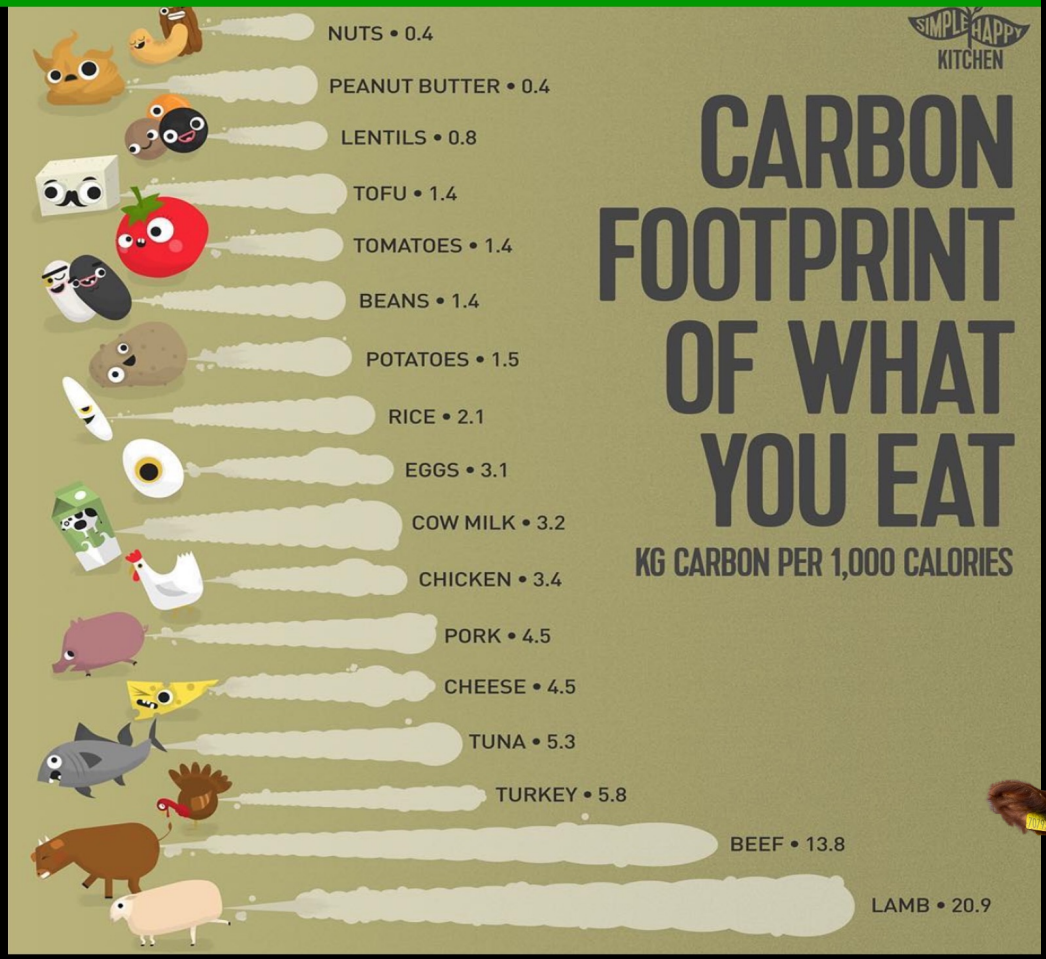

Source: Created by Jude L. Capper, 2023. Infographic from https://www.instagram.com/simple_happy_kitchen/

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Improving animal productivity reduces the environmental impact of milk and meat

Total livestock
Total time

Land
Water
Fuel
GHG

Growth rate
Meat yield
Milk yield

£££

Source: Created by Dr. Jude L. Capper, 2020. Data from: Capper, JL. 2015. Sustainability and One Health. In: Cockcroft, P. *Bovine Medicine.* Wiley-Blackwell, Oxford, UK.

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Improved efficiency has reduced GHG emissions from U.S. livestock production

19% decrease in GHG emissions per litre of ECM between 2007 and 2017

18% decrease in GHG emissions per kg of HCW beef between 1977 and 2007

35% decrease in GHG emissions per kg of pork between 1959 and 2009

63% decrease in GHG emissions per ton of eggs between 1960 and 2010

Source: Created by Jude L. Capper, 2023. Data from: Capper, J. L. and R. A. Cady, https://doi.org/10.1093/jas/skz291; Capper, J. L. https://doi.org/10.2527/jas.2010-3784; Cady, R. A. et al. (2013) A 50-year comparison of the environmental impact and resource use of the US swine herd: 1959 vs. 2009. ADSA-ASAS Annual Meeting, 2013, Indianapolis, IN; and Pelletier, N. et al. https://doi.org/10.3382/ps.2013-03390.

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Reducing age at slaughter has both economic and environmental benefits

	23 mo	26 mo
Birth weight	40 kg	40 kg
Slaughter weight	670 kg	670 kg
Total gain	630 kg	630 kg
Age at slaughter	23 months	26 months
Daily liveweight gain	0.90 kg/d	0.80 kg/d
Maintenance feed needed	702 days	793 days

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	40 kg	40 kg
Slaughter weight	670 kg	670 kg
Total gain	630 kg	630 kg
Age at slaughter	23 months	26 months
Daily liveweight gain	0.90 kg/d	0.80 kg/d
Maintenance feed needed	702 days	793 days

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

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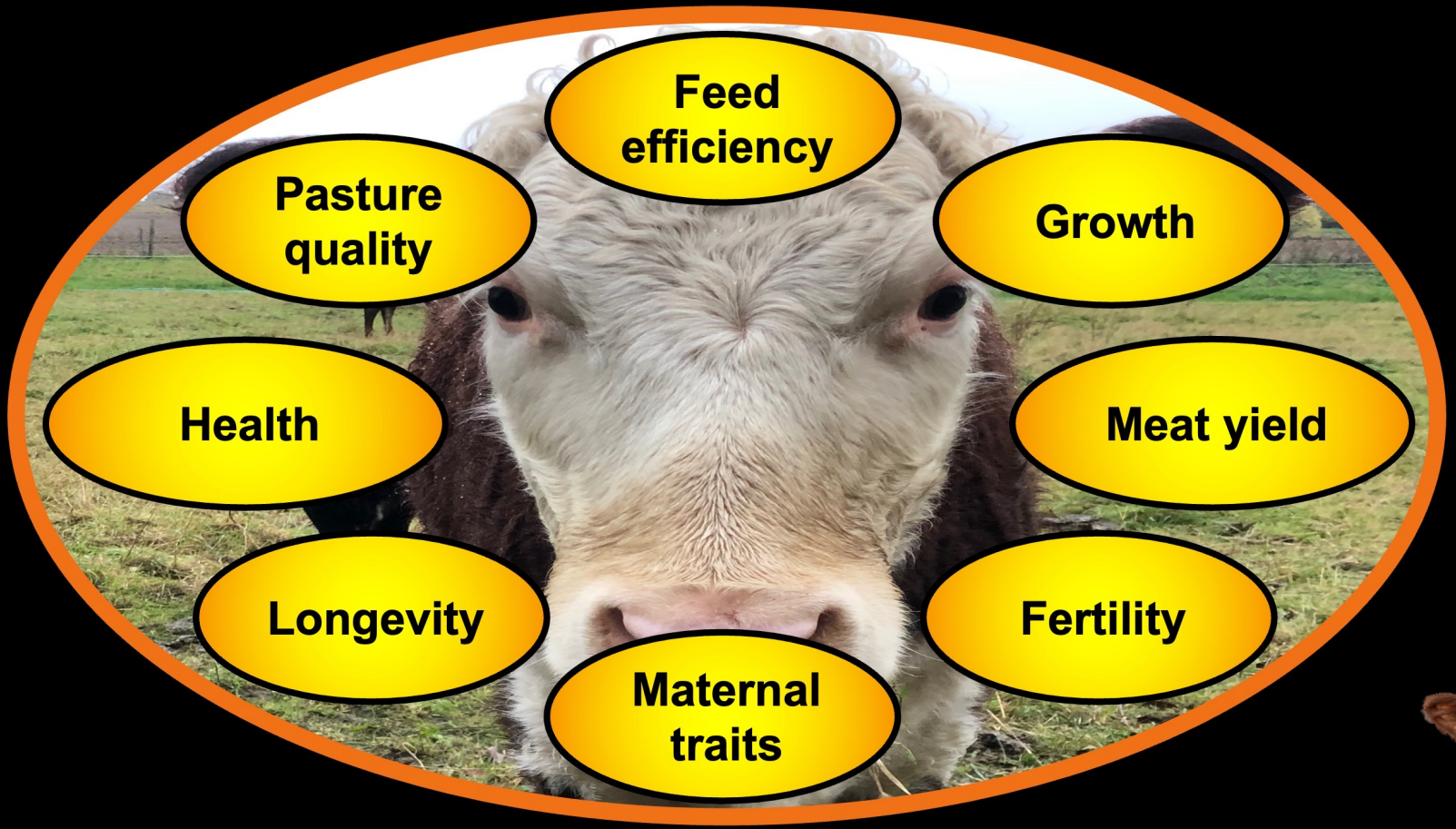
Improving key performance indicators reduces environmental impacts



Source: Created by Jude L. Capper, 2023

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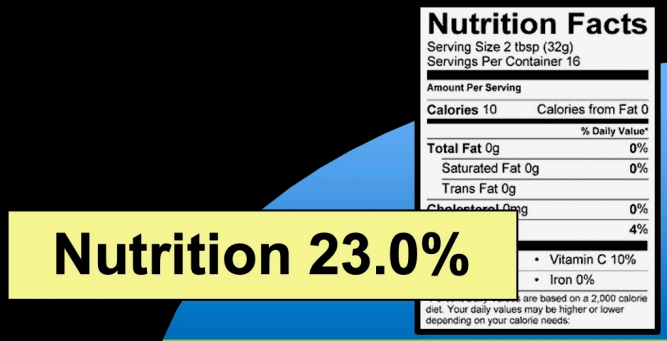
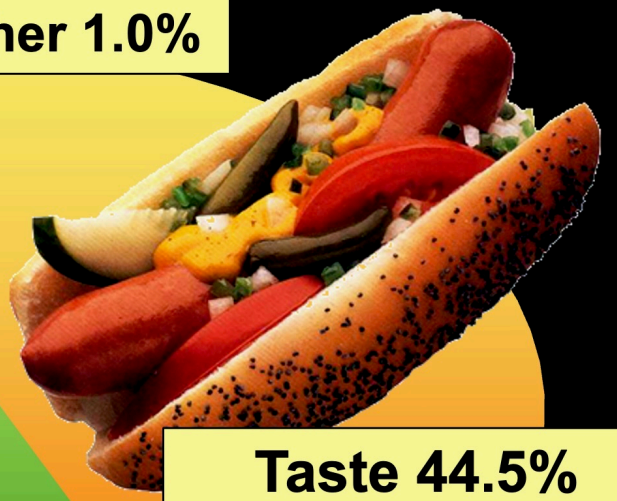
Consumer buying choices are based on three primary factors



Nutrition 23.0%

Other 1.0%



Taste 44.5%

Cost 31.5%

Source: Created by Jude L. Capper, 2023; Data from: Simmons (2011). Making safe, affordable and abundant food a global reality. Elanco Animal Health.

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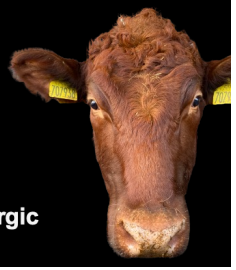
Implant and beta-agonist use improves beef economic and environmental metrics

Feed Cost | **Water** | **Carbon**

$1.37 | **556 litres** | **5.28 kg**

Resources saved per kg boneless beef

Source: Created by Jude L. Capper, 2023. Data from: Capper (2013). The environmental and economic impact of steroid implant and beta-adrenergic agonist use within U.S. beef production. ADSA/ASAS Annual Meeting held in Indianapolis, IN, USA on July 11th – 15th, 2013.



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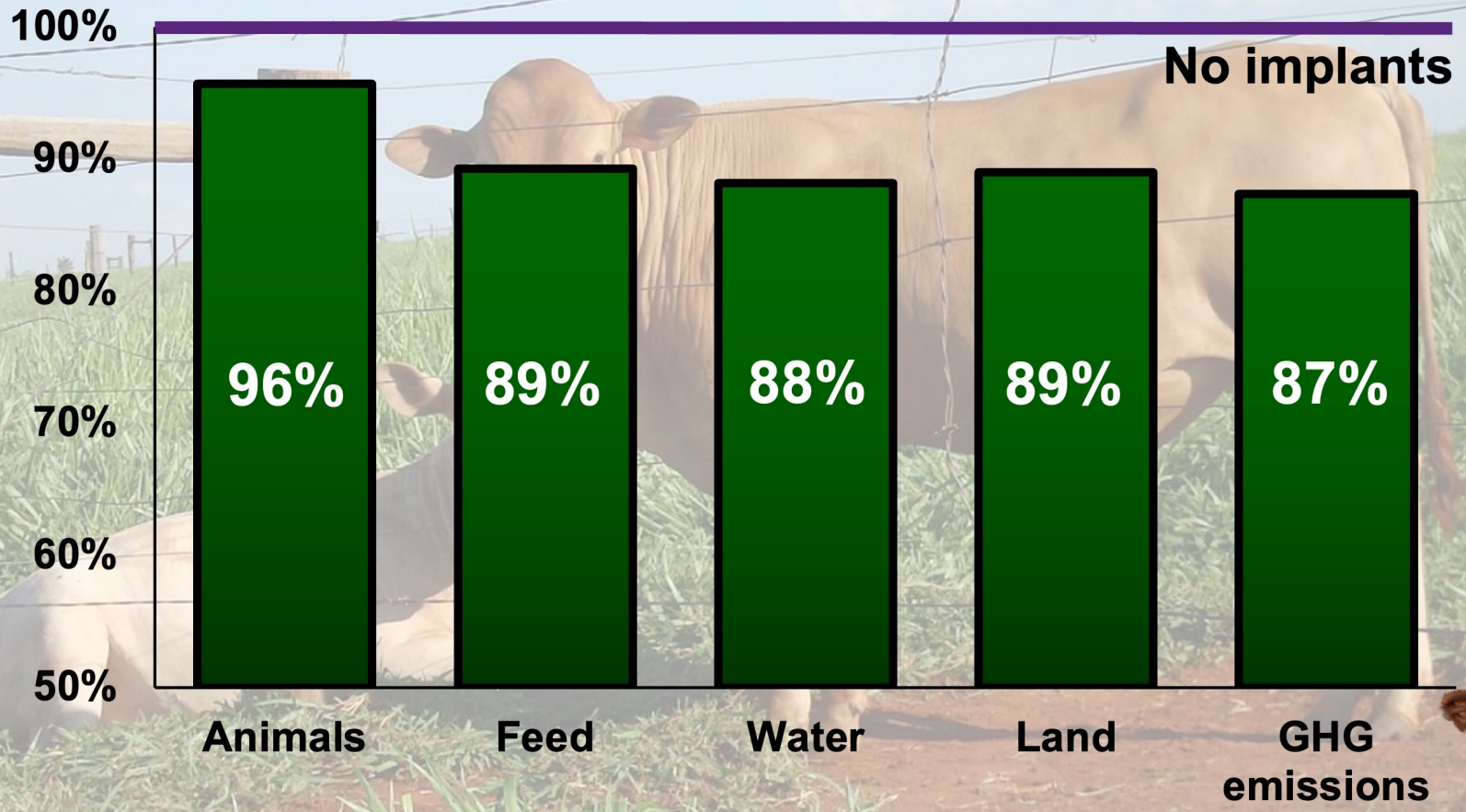
Environmental impacts of Brazilian beef production would be reduced by implant use



Source: Created by Jude L. Capper, 2023; data from: Capper, J. L. et al. (2021). https://doi.org/10.1093/tas/txab144
Households based on 2 people/house. *All values are for moderate performance effects of implant use, expressed per kg HCW beef.

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At the population level, implant use in Brazilian beef would have significant impacts

Houses heated	Household water use	Cars removed	Trees planted
			
0.40 million	1.83 million	62.0 million	11.3 billion

Source: Created by Jude L. Capper, 2023; data from: Capper, J. L. et al. (2021). https://doi.org/10.1093/tas/txab144
Households based on 2 people/house.

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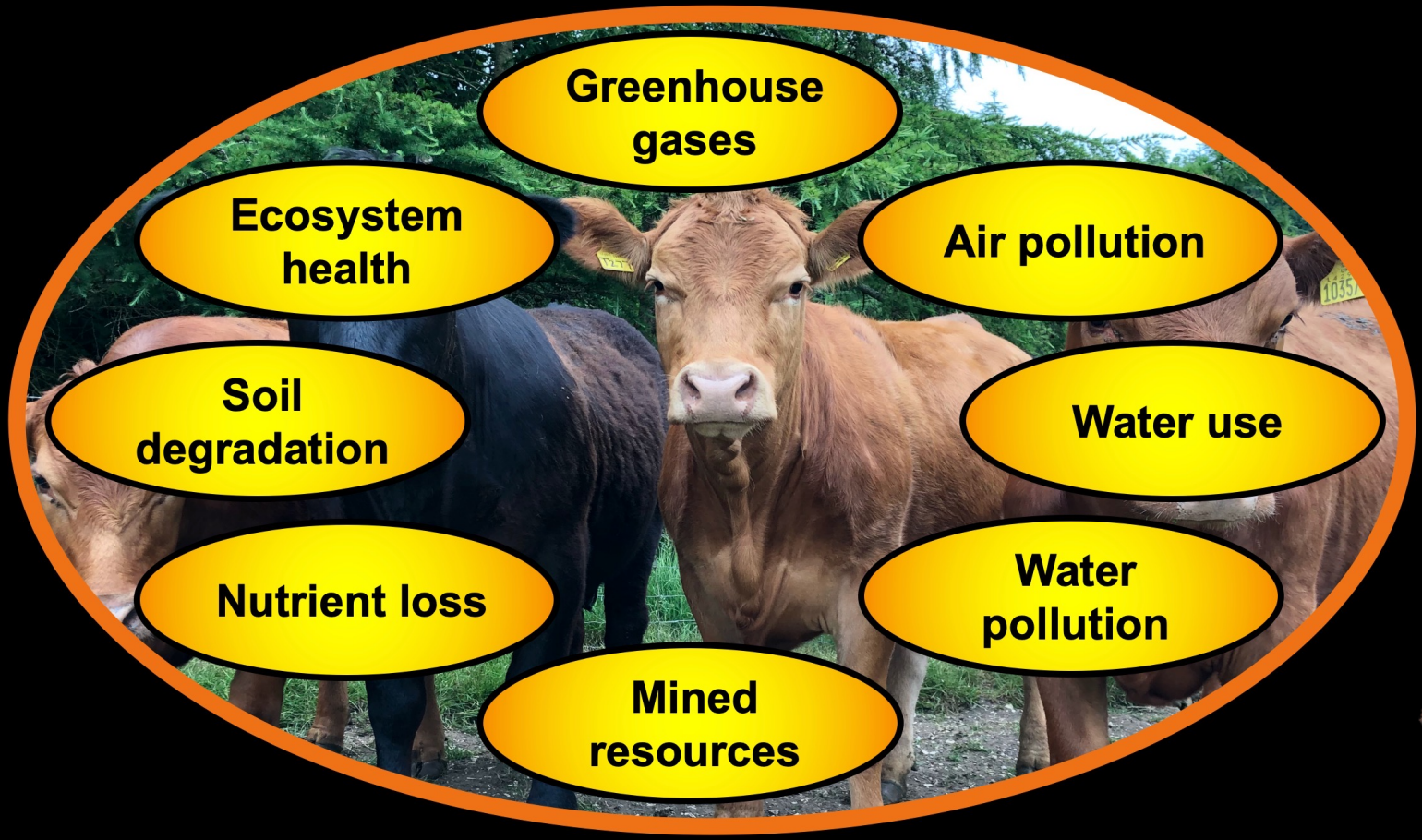
Environmental impacts are not limited to greenhouse gas emissions



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Source: Created by Dr. Jude L. Capper, 2020

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Feed efficiency is one of the principal issues used to denigrate animal agriculture

IF EVERY AMERICAN STOPPED EATING MEAT

THERE WOULD BE ENOUGH GRAIN TO FEED 1.4 BILLION PEOPLE

#IMAGREENMONSTER

Source: Created by Jude L. Capper, 2023. Picture from: https://www.onegreenplanet.org/animalsandnature/eat-for-the-planet-meat-and-the-environment/

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Can we grow human food crops everywhere?

Source: Created by Jude L. Capper, 2023

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>60% of UK land is not suitable for growing arable crops

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Source: Created by Jude L. Capper, 2023. Grazing land includes temporary grass on arable land (5% of total). Data from DEFRA. 2020. Farming statistics - provisional crop areas, yields and livestock populations at 1 June 2020 – United Kingdom.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/946161/structure-jun2020final-uk-22dec20.pdf

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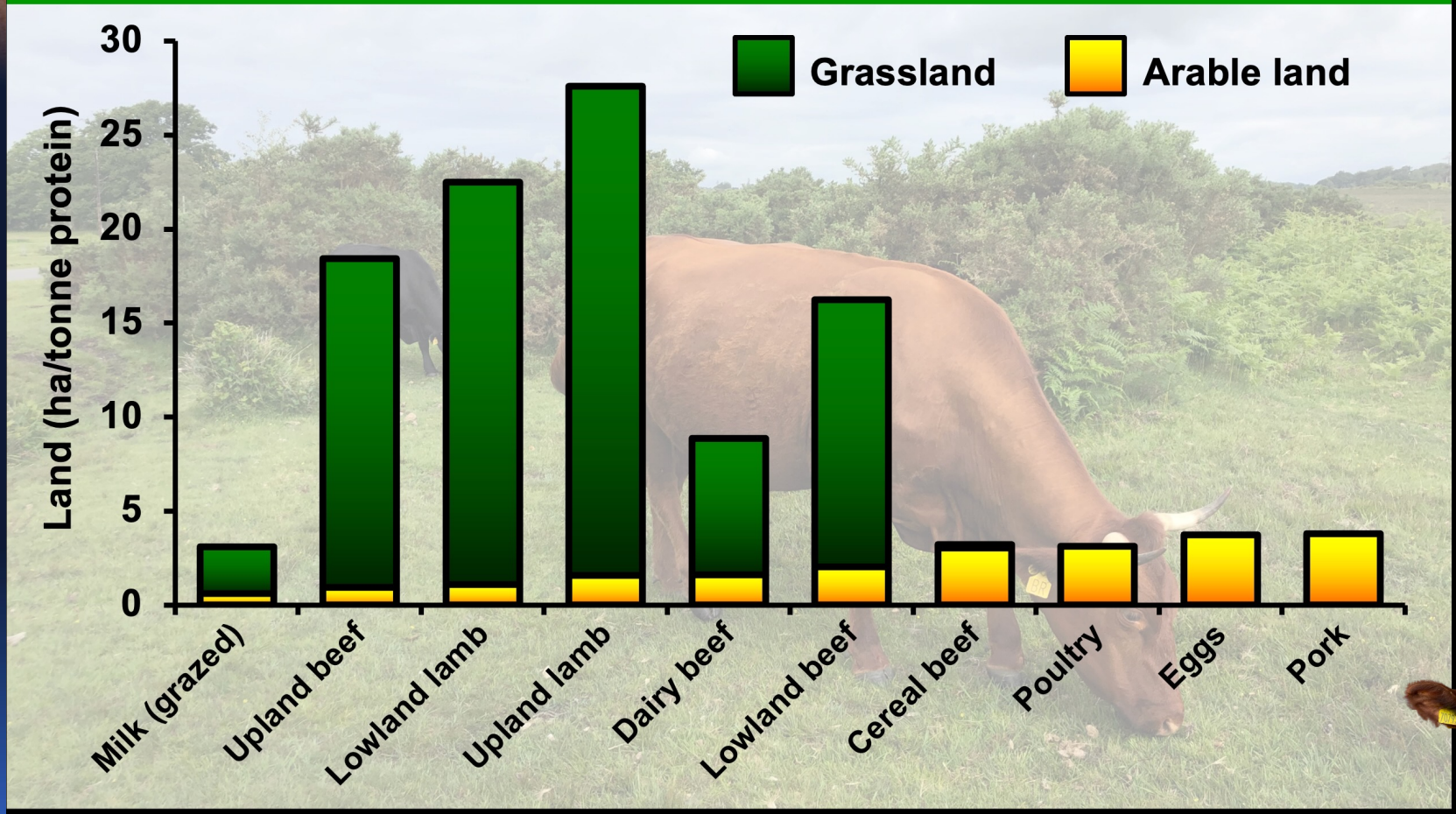
Livestock systems vary widely in arable and grassland use



Source: Created by Jude L. Capper, 2023; data from Wilkinson and Lee (2018) Review: Use of human-edible animal feeds by ruminant livestock. *Animal.*

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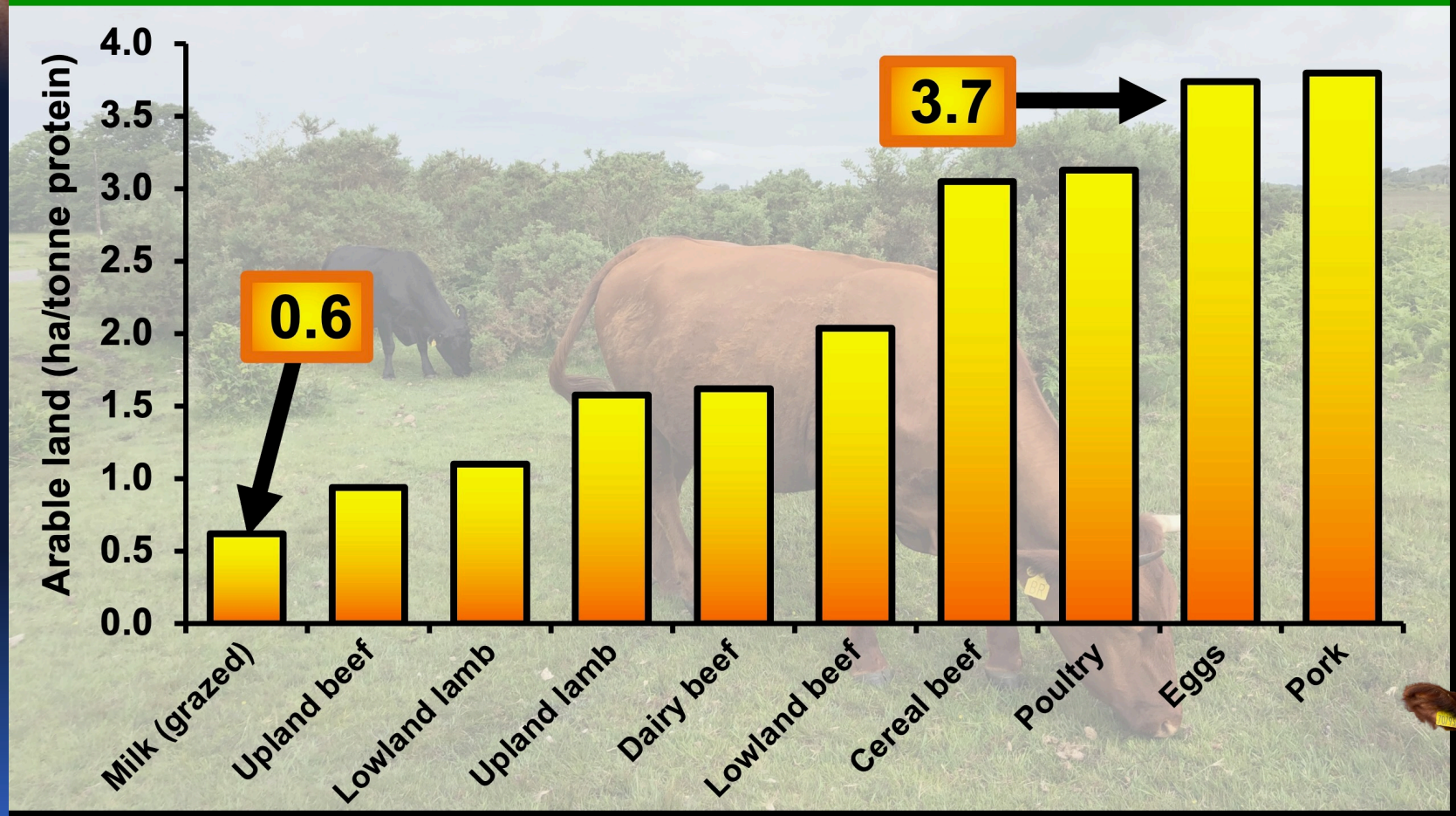
Livestock systems vary widely in arable land use



Source: Created by Jude L. Capper, 2023; data from Wilkinson and Lee (2018) Review: Use of human-edible animal feeds by ruminant livestock. *Animal.*

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What do these industries have in common? They all provide by-products fed to animals

Source: Created by Jude L. Capper, 2023.

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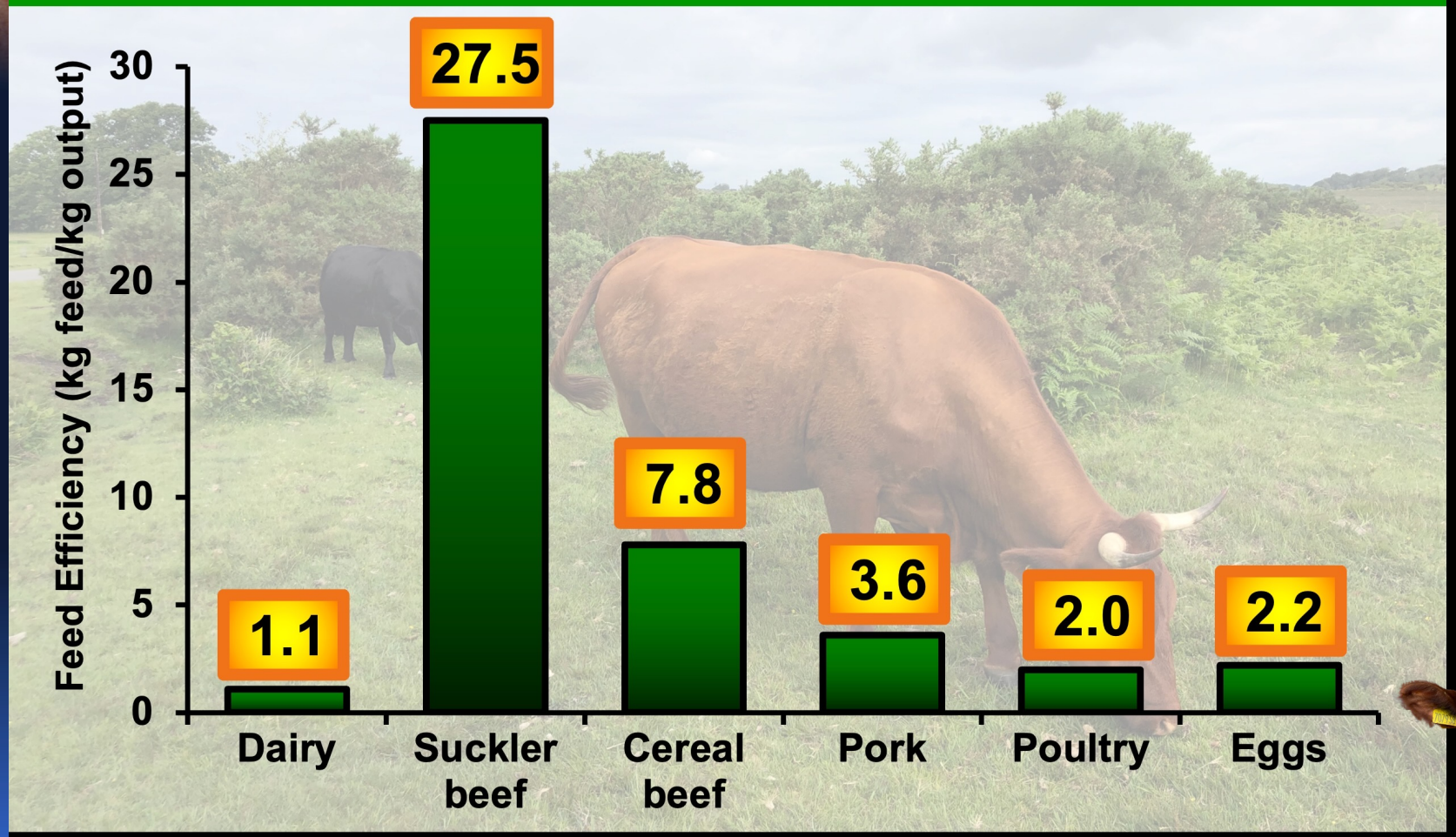
Feed efficiency ratios vary between systems and species



Source: Created by Jude L. Capper, 2023; data from Wilkinson (2011) https://doi.org/10.1017/S175173111100005X

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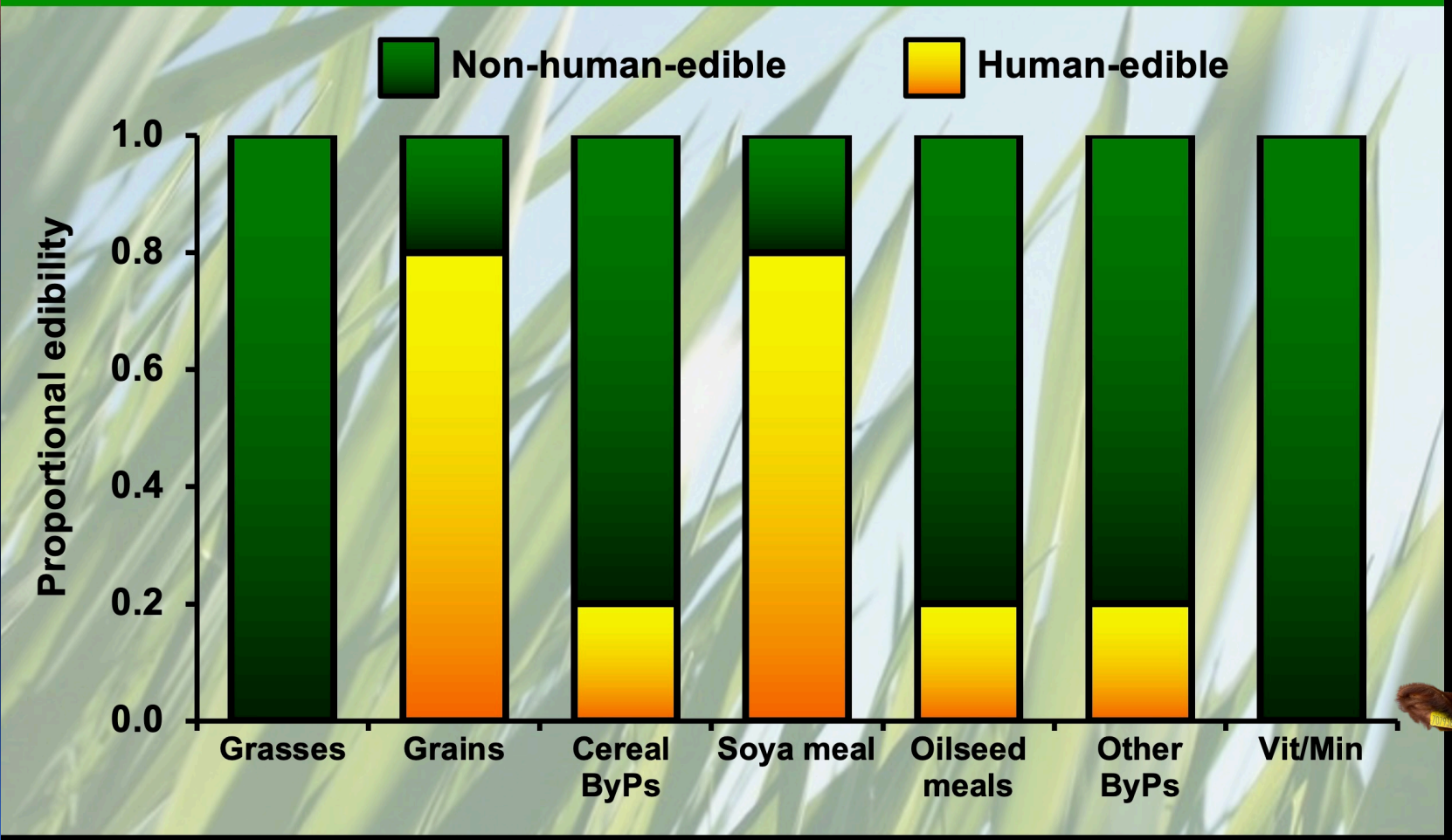
Feed efficiency metrics must consider competition for human-edible foods



Source: Created by Jude L. Capper, 2023; data from Wilkinson (2011) https://doi.org/10.1017/S175173111100005X

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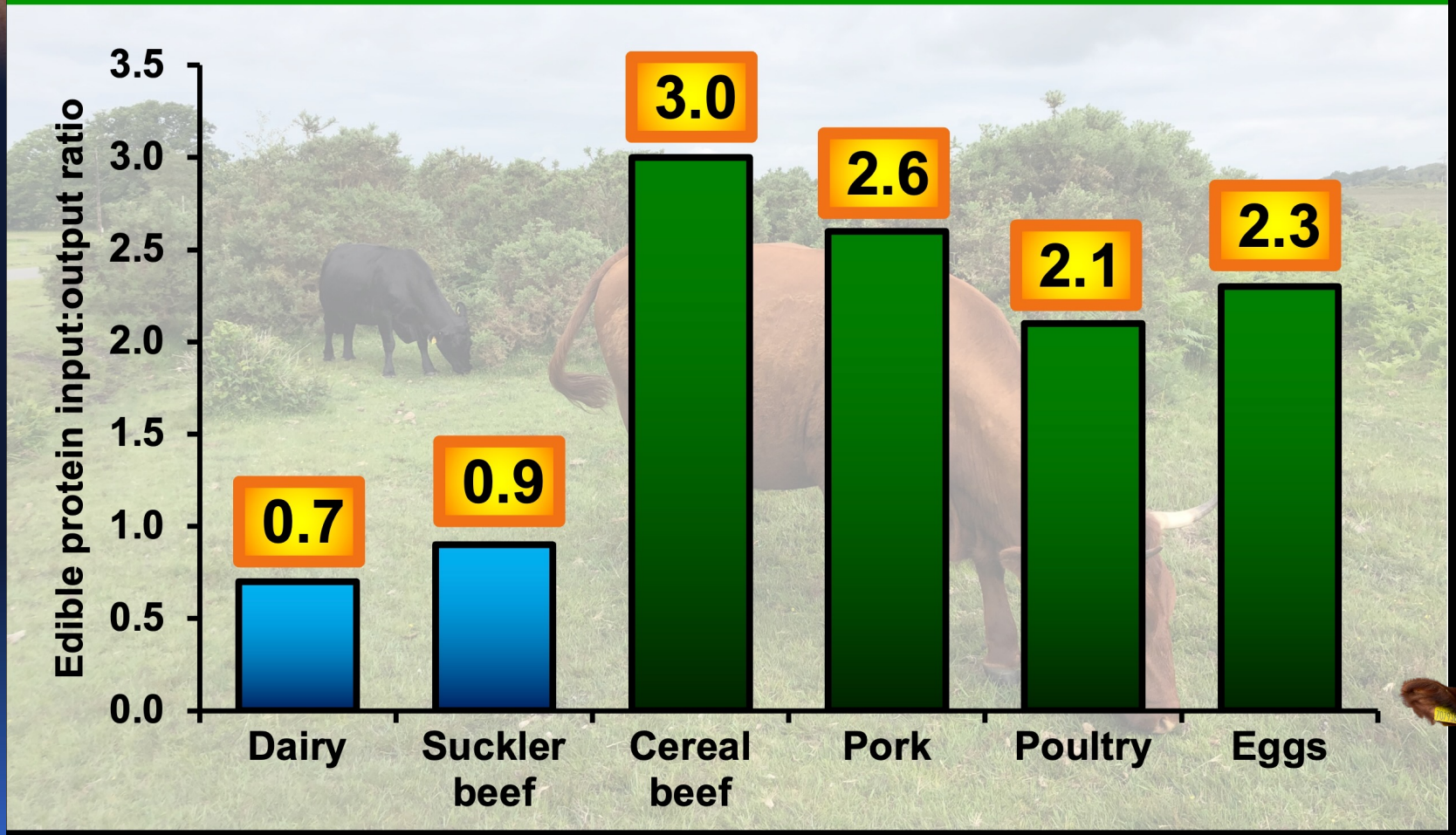
Grazing cattle systems produce more human-edible protein than they consume



Source: Created by Jude L. Capper, 2023; data from Wilkinson (2011) Re-defining efficiency of feed use by livestock. *Animal.*

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Removing cattle from pasture disadvantages ground-nesting birds

Source: Created by Jude L. Capper, 2023. Photo from Odd Falch https://www.pexels.com/photo/brown-bird-on-brown-grass-12084162/

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Dung beetles have myriad ecosystem benefits

Source: Created by Jude L. Capper, 2023.

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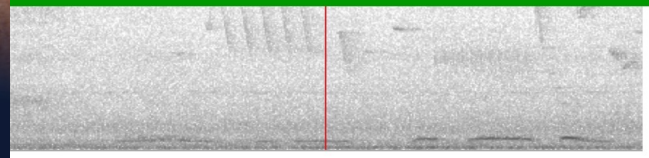
Merlin app is a great example of ecosystem data gathering



00:04.55

BEST MATCHES


Common Chaffinch


Common Wood-Pigeon


Eurasian Wren


European Goldfinch


Eurasian Blackbird

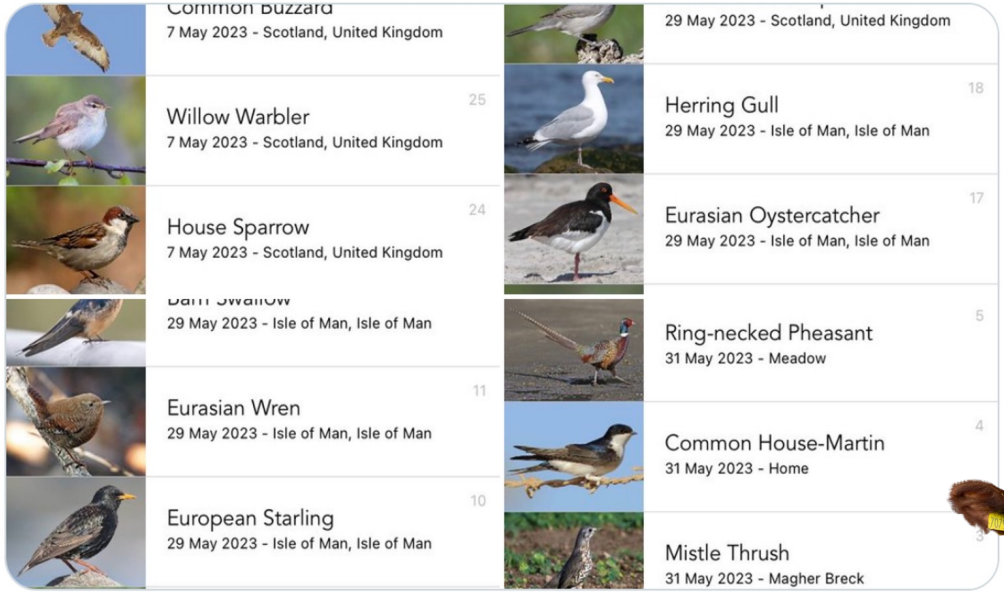

Eurasian Collared-Dove


European Robin

Anna Kerruish @ManxShepherdess · May 31

Slightly addicted to the **#merlin app**, to the point that there's an on farm competition. Whoever gets most **birds** by 14/6 gets a box of French Fancies 🧁

Now leaving my phone at the gate of each field while I drive the quad round checking sheep, because I'm that competitive 😂



Manx Wildlife Trust

Source: Created by Jude L. Capper, 2023. Screenshots from Merlin app and Twitter.

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Our biggest challenge is to keep meat and dairy in the diets of future food purchasers

Source: Created by and photo from Jude L. Capper, 2023.

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Do 706,965 Veganuary participants in 2023 amount to more than a hill of beans?

- Total equals 14% of the population of Cape Town
- If all participants were based in South Africa they would comprise 1.2% of the population
- Average of 3,663 per participating country
- 60% of participants already vegan, vegetarian or pescatarian

Source: Created by Jude L. Capper, 2023. Information from: https://veganuary.com/blog/

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

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"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

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Source: Created by Jude L. Capper, 2023. Information from YouGov (2019) Is the future of food flexitarian? https://yougov.co.uk/topics/resources/articles-reports/2019/03/18/future-food-flexitarian

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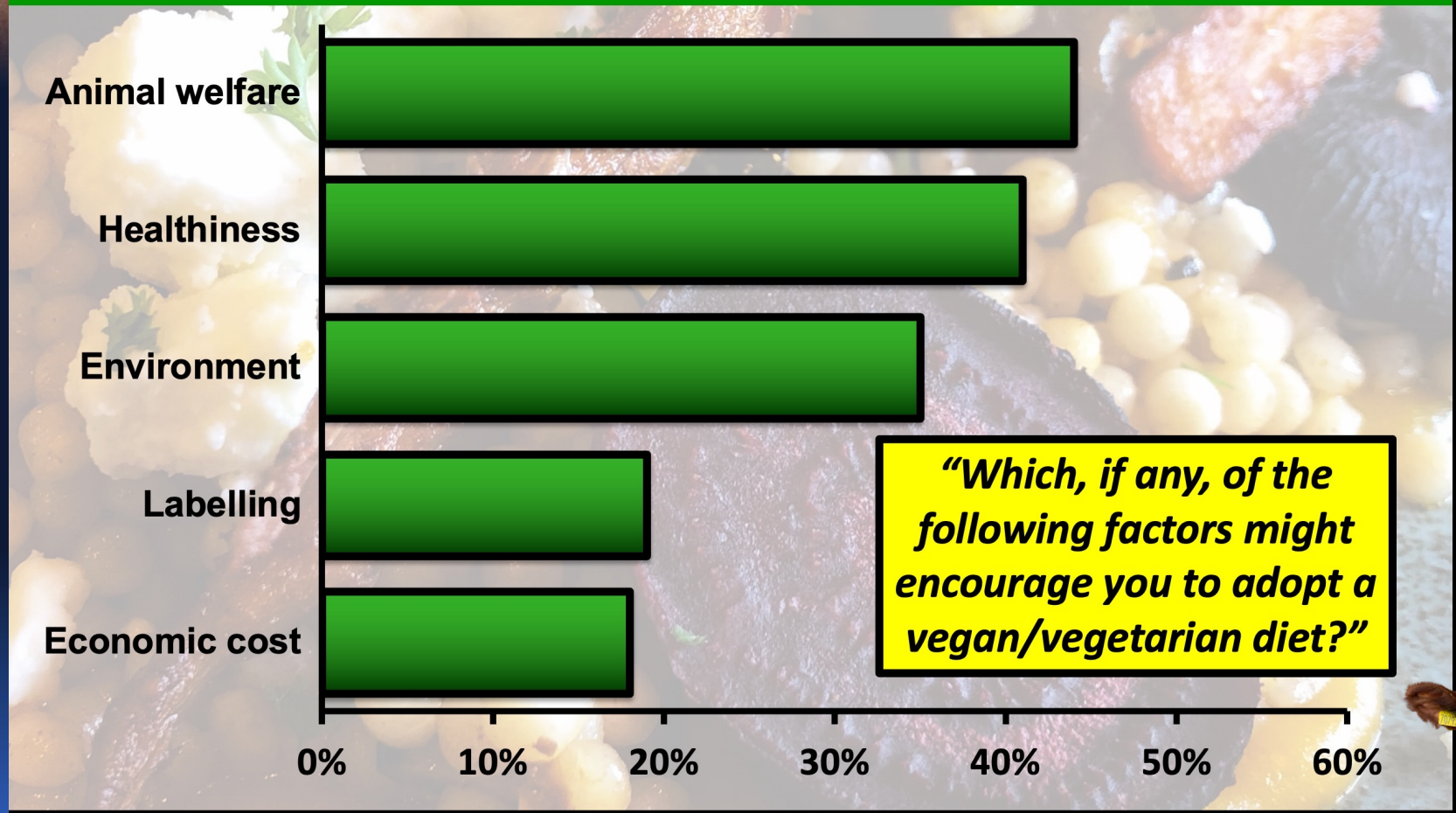
Animal welfare, health and the environment are primary consumer concerns



Source: Created by Jude L. Capper, 2023. Information from: YouGov (2019) Is the future of food flexitarian? https://yougov.co.uk/topics/resources/articles-reports/2019/03/18/future-food-flexitarian

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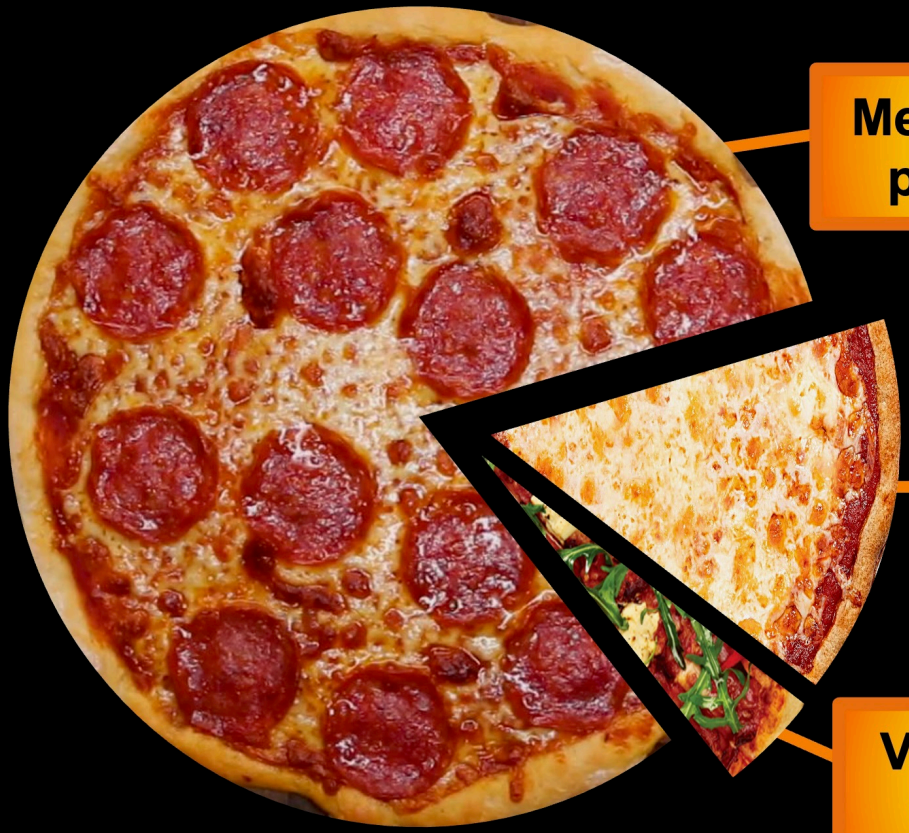
The future probably isn't vegan, but it may be flexitarian?



Meat-eater (78%) or pescatarian (3%)

Flexitarian (15%)

Vegetarian (3%) or vegan (1%)

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Source: Created by Jude L. Capper, 2023. 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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CV

New CREDS report puts transport, energy and food choices into context

Top 10 options for reducing your carbon footprint

1	2.04	Live car-free
2	1.95	Battery electric vehicle
3	1.68	One less flight (long-haul return)
4	1.6	Renewable electricity
5	0.98	Public transport
6	0.895	Refurbishment and renovation
7	0.8	Vegan diet
8	0.795	Heat pump
9	0.65	Improved cooking equipment
10	0.64	Renewable-based heating

CREDS

Source: Created by Jude L. Capper, 2023. Infographic adapted from Centre for Research into Energy Demand Solutions (2020). Available at: https://twitter.com/CREDS_UK/status/1262984570175176704?s=20

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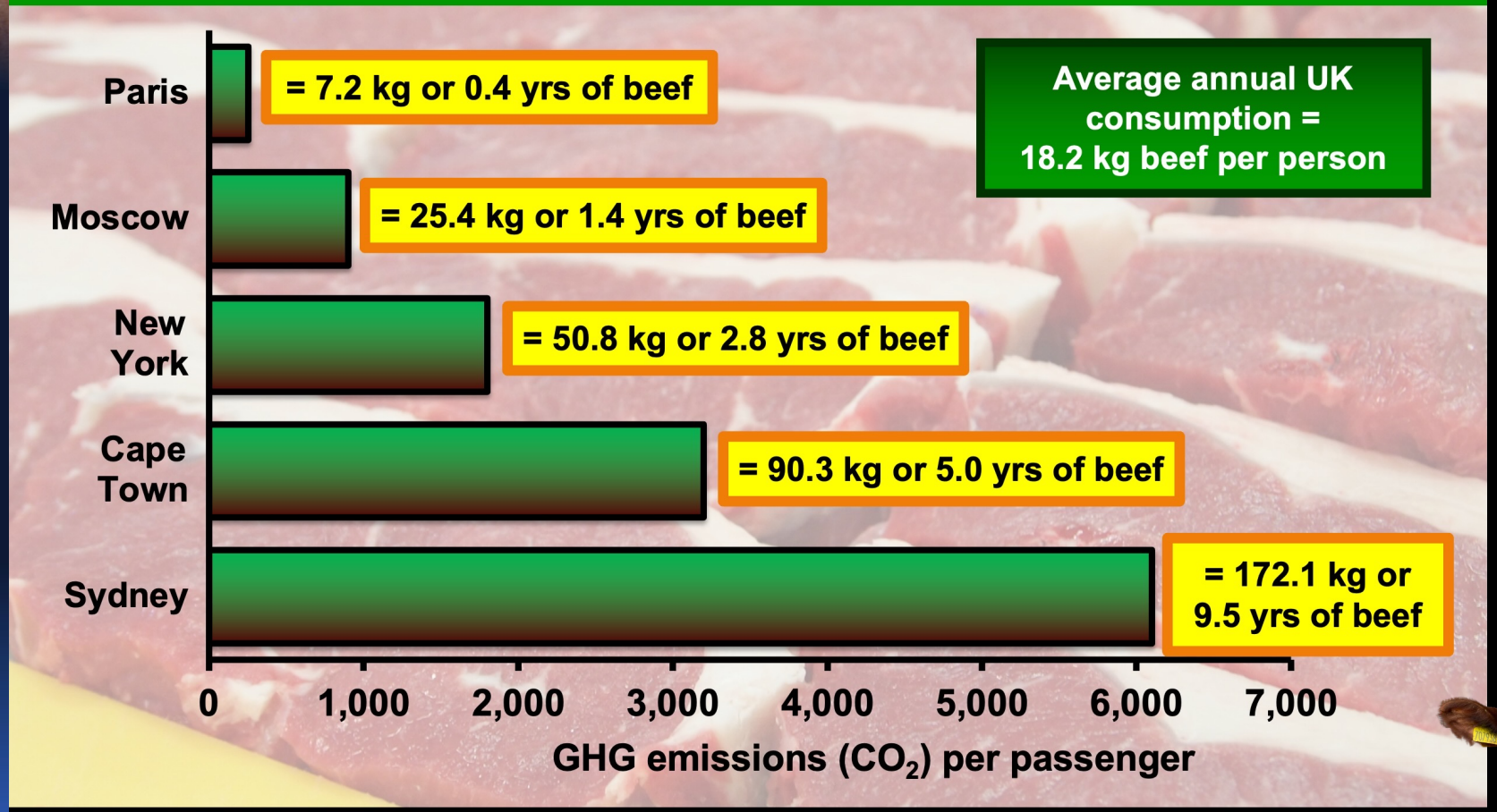
International flights emit considerable quantities of carbon compared to beef production



Source: Created by Jude L. Capper, 2023. Calculations based on GHG emissions flight data from: https://co2.myclimate.org/en/flight_calculators/new and on a carbon footprint per kg of boneless beef of 35.5 kg CO2-eq (under GWP100) from AHDB: http://beefandlamb.ahdb.org.uk/wp-content/uploads/2013/05/p_cp_down_to_earth300112.pdf

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

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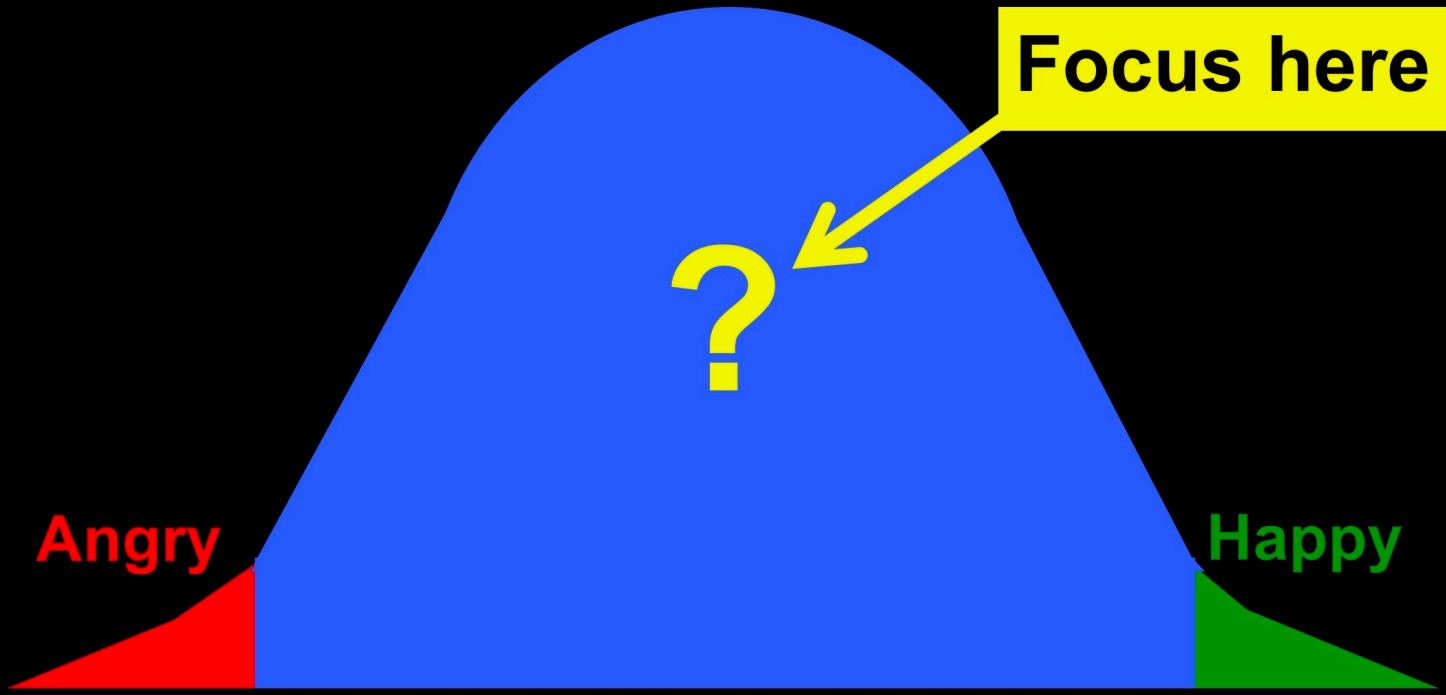

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Source: Created by Dr. Jude L. Capper, 2017

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

Source: Created by and photos from Jude L. Capper, 2023.

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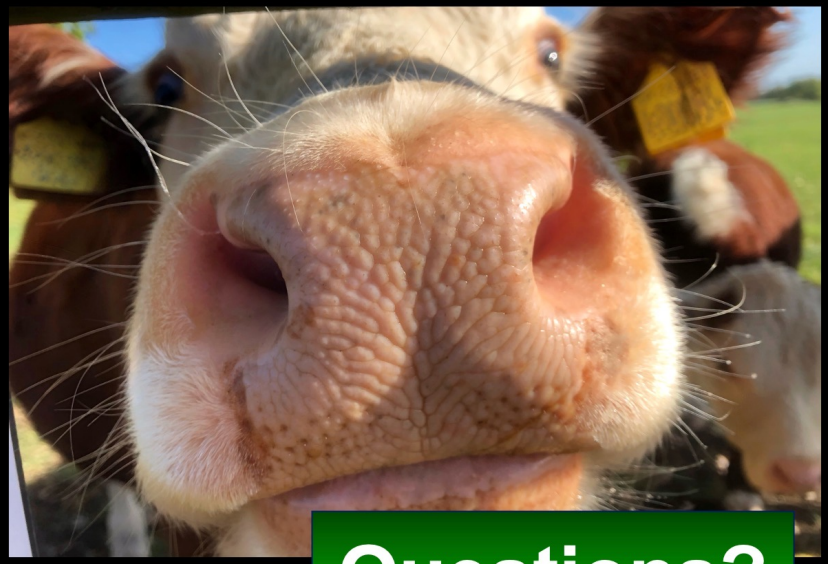
Thank you!

jude@livestocksustainability.com

http://bovidiva.com/presentationlinks



Questions?

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Source: Created by Dr. Jude L. Capper, 2022. Cartoon from: http://snipurl.com/methanecartoon