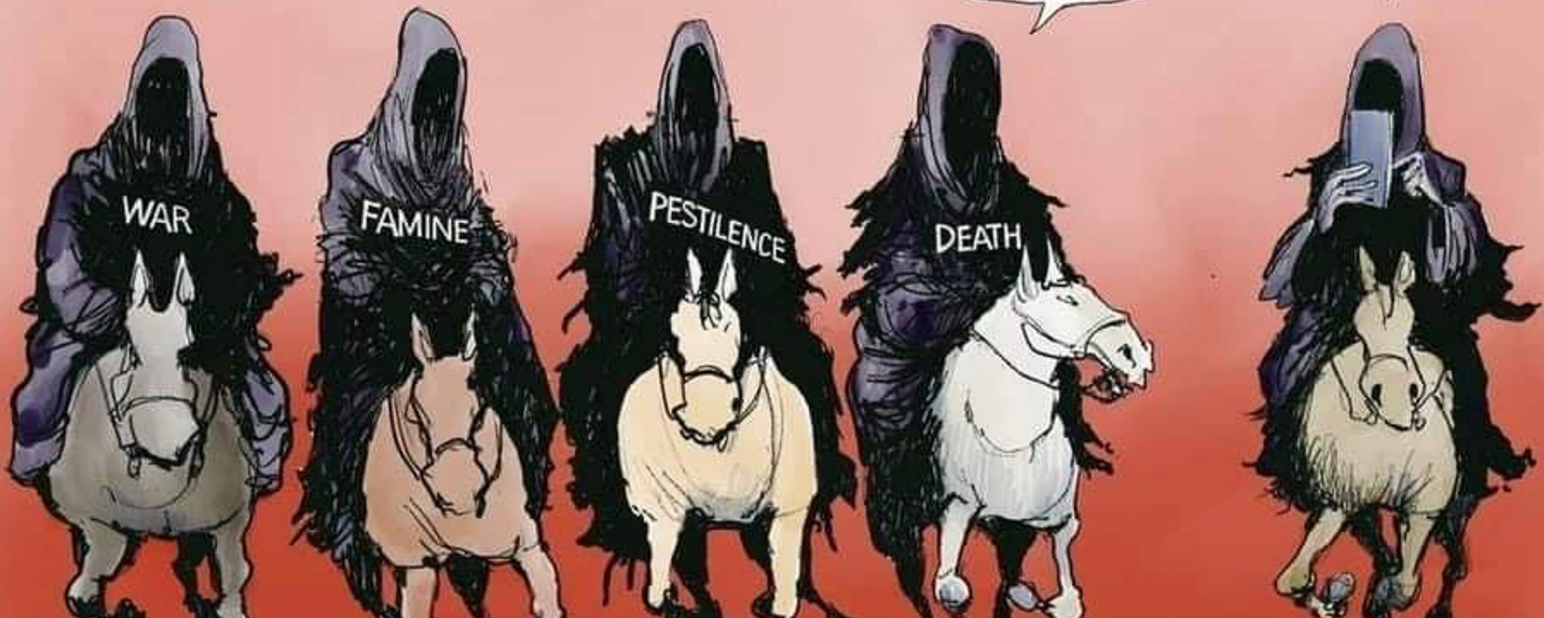


# Sustainable Ruminant Production

Bramhall  
NYDN



3<sup>rd</sup> May 2022

Source: Dr. Jude L. Capper, 2022

Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader



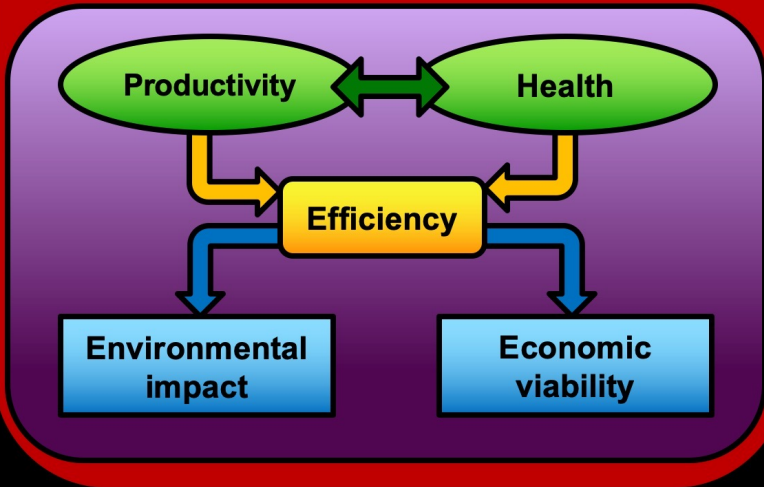
COM

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

Jude Capper, PhD  
@bovidiva



## Social Acceptability



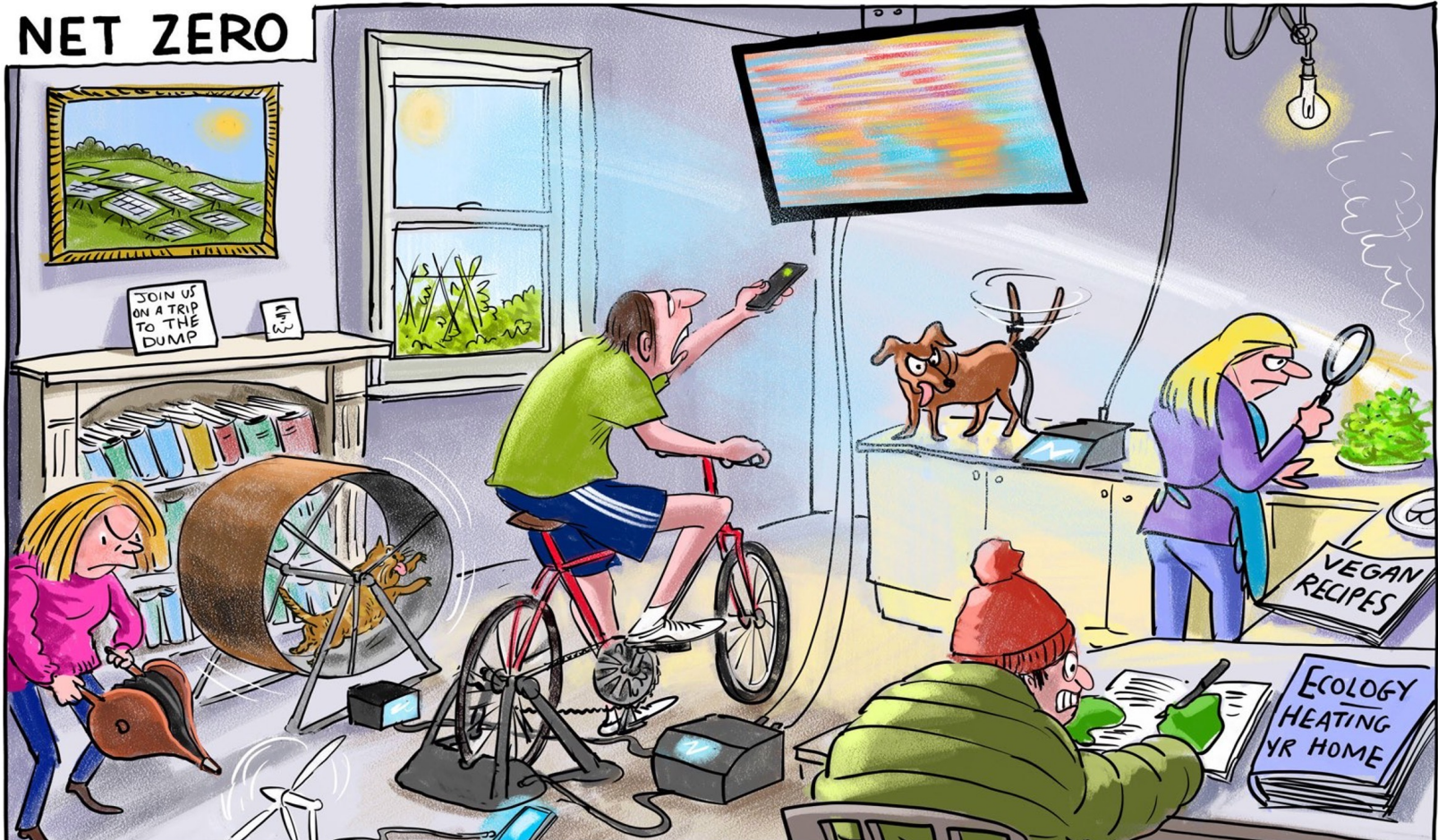
## Sustainability



Beef & Lamb AgriLeader

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



Jude Capper, PhD  
 @bovidiva

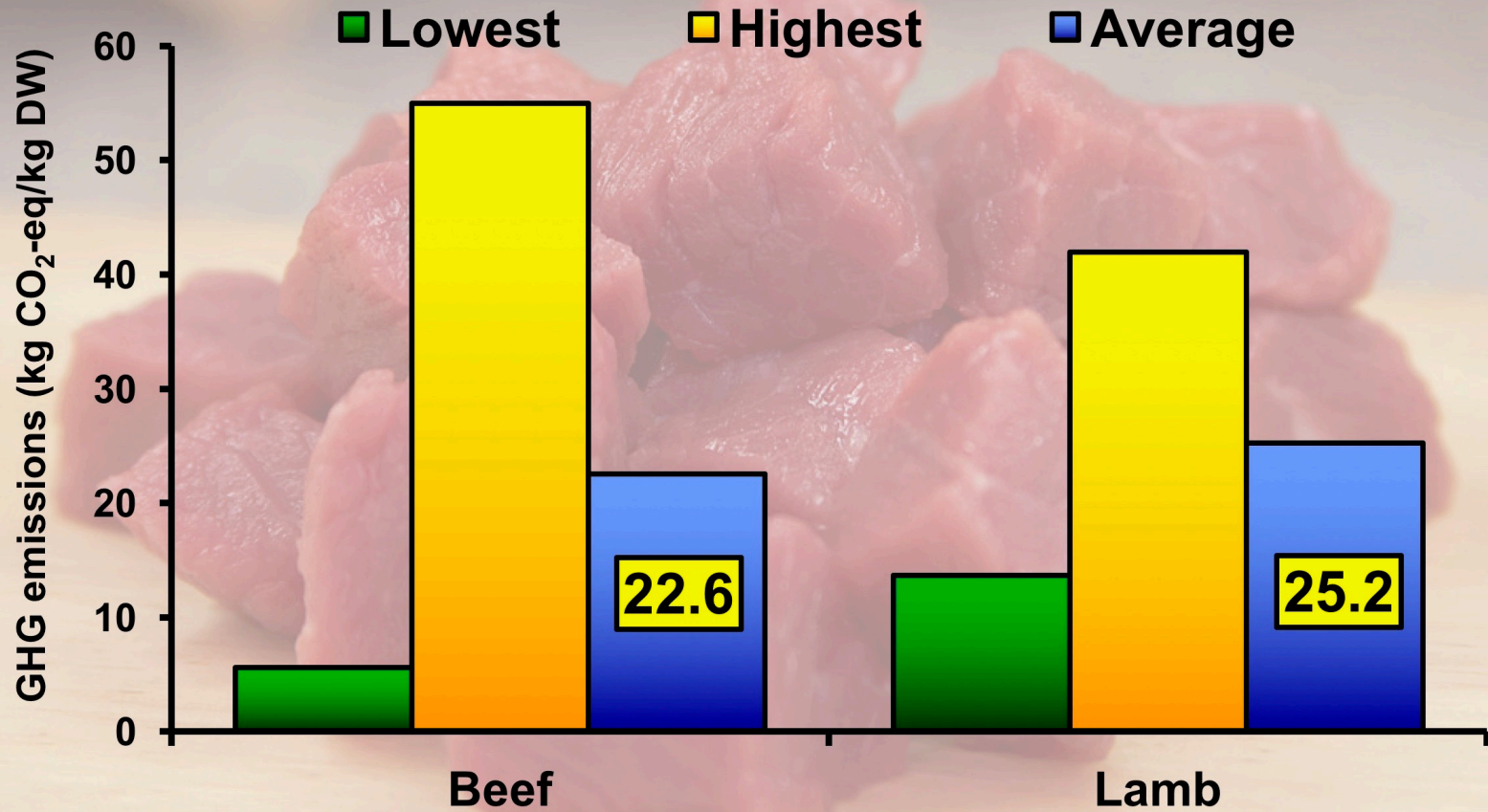


Beef & Lamb AgriLeader



B

# Carbon footprints of English beef and lamb show significant variation



Source: Created by Dr. Jude L. Capper, 2016; data from 131 beef units and 57 sheep units analyzed by E-CO<sub>2</sub> and reported in: EBLEX (2012) Down to Earth – The Beef and Sheep Roadmap – Phase Three. AHDB, Stoneleigh, UK.

Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



# Committee on Climate Change aims to free 22% of agricultural land by 2050

## Actions must be taken now...



Increase **low-carbon farming practices** for soils & livestock.

**Behaviour change is also needed:**

Reduce beef, lamb and dairy consumption by **20%** per capita by 2050.

### Behaviour change is also needed:

Reduce beef, lamb and dairy consumption by **20%** per capita by 2050.



Reduce food waste by **20%** by 2030.

Jude Capper, PhD  
@bovidiva



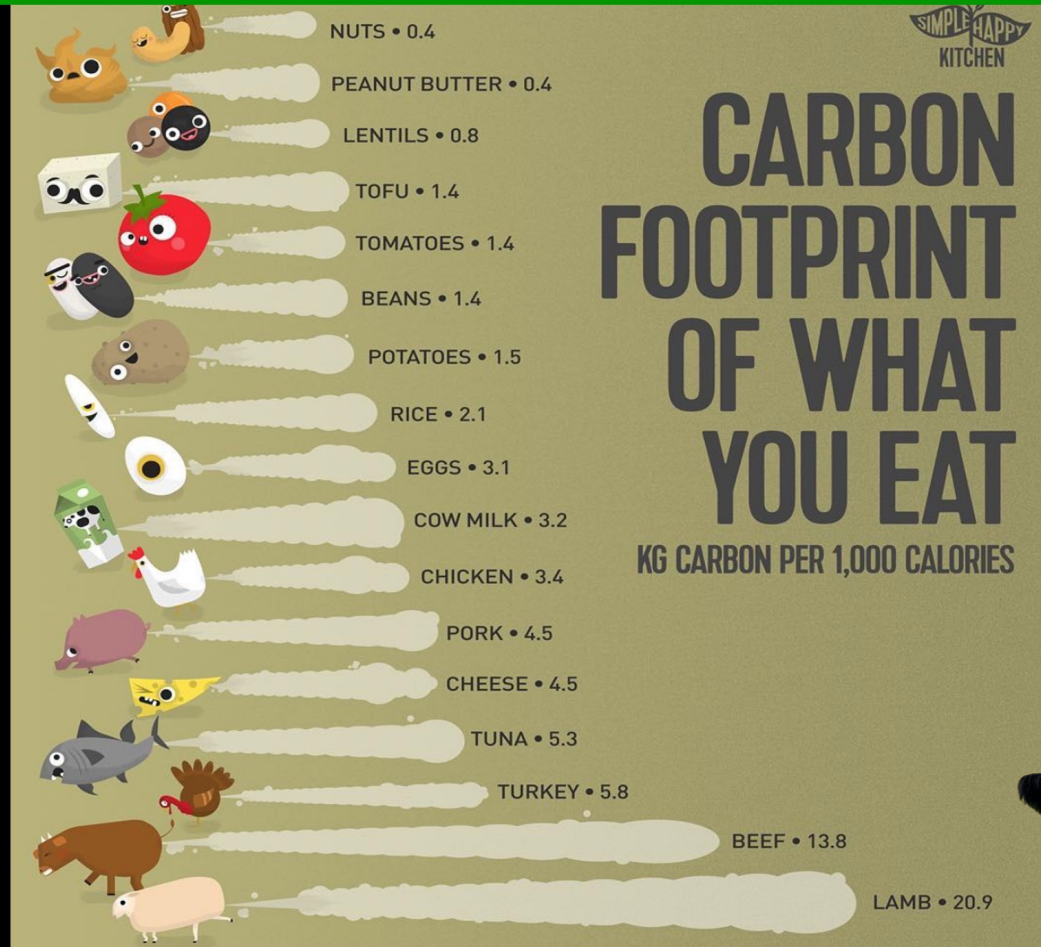
Beef & Lamb AgriLeader



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

Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader

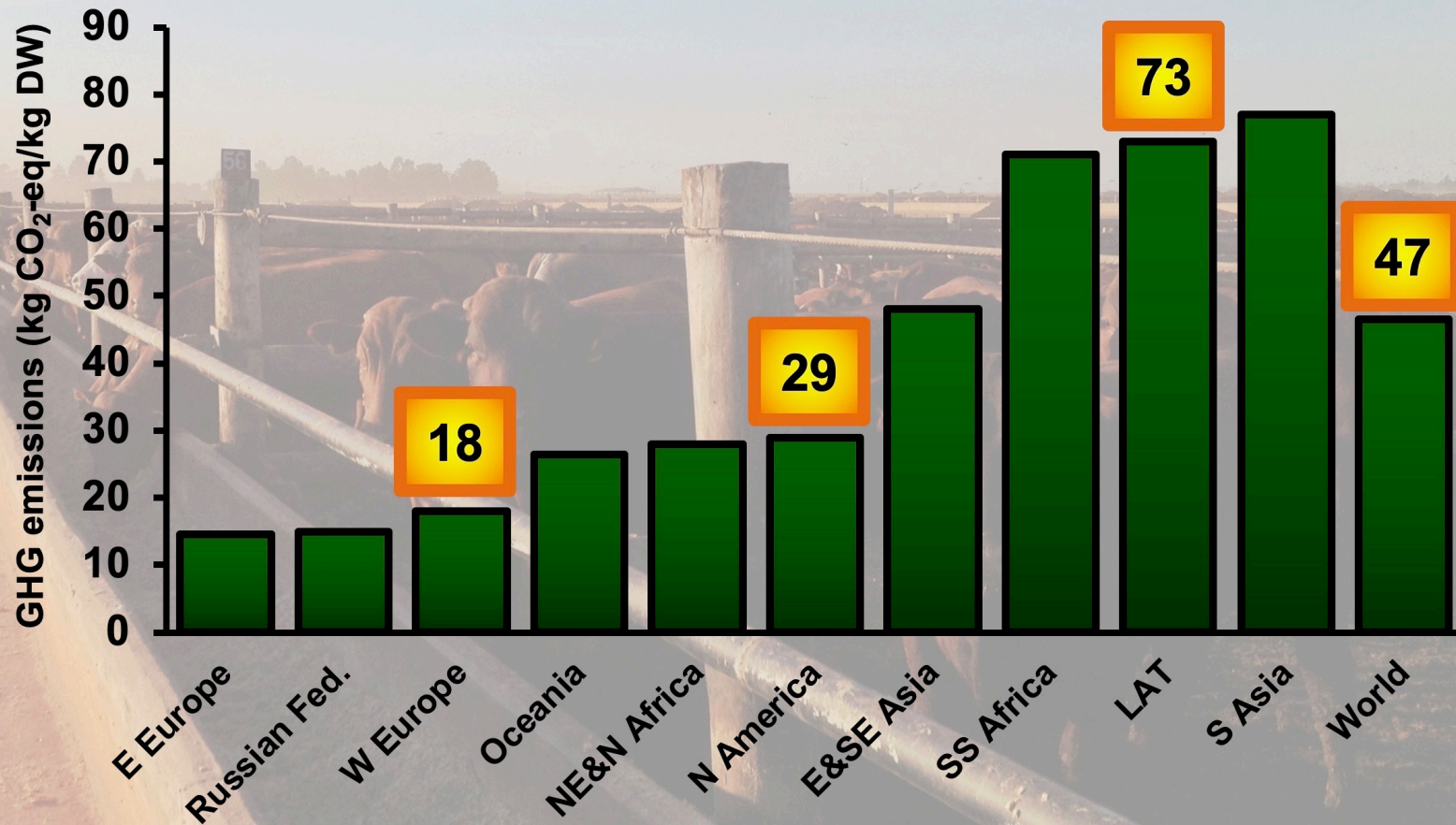


Jude Capper, PhD  
@bovidiva



B

## The carbon footprint of beef production varies across the globe



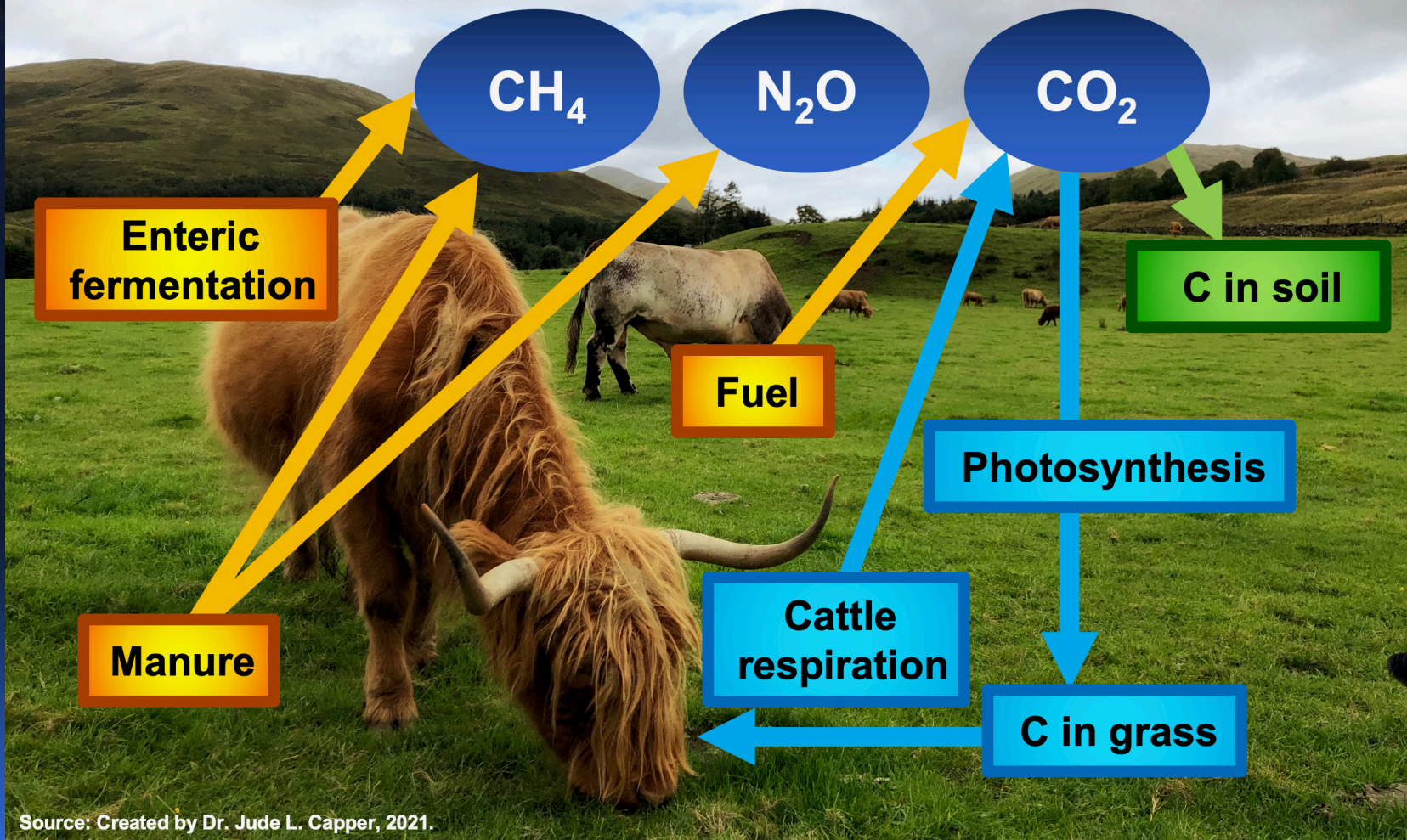
Source: Created by Dr. Jude L. Capper, 2020; data from Gerber et al. (2013) Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. FAO, Rome, Italy.

Beef & Lamb AgriLeader



B

All components of the carbon cycle must be accounted for



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

Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader





B

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



Jude Capper, PhD

@bovidiva



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.

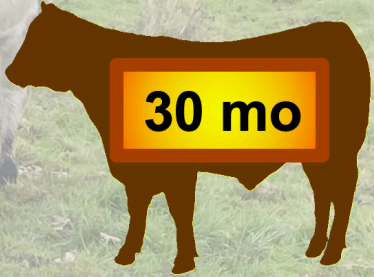
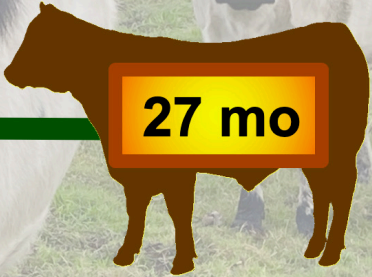
Beef & Lamb AgriLeader



B

# 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  |

Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader



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

B

# Reproductive interventions must be economically and environmentally sustainable

Improving maternal trait genetics via AI over 20 yrs

95 - 2,009 kg CO<sub>2</sub> reduction in GHG emissions per cow

Decreased mature weight and calving interval

£47-344 improved economics per cow calving

Jude Capper, PhD  
@bovidiva

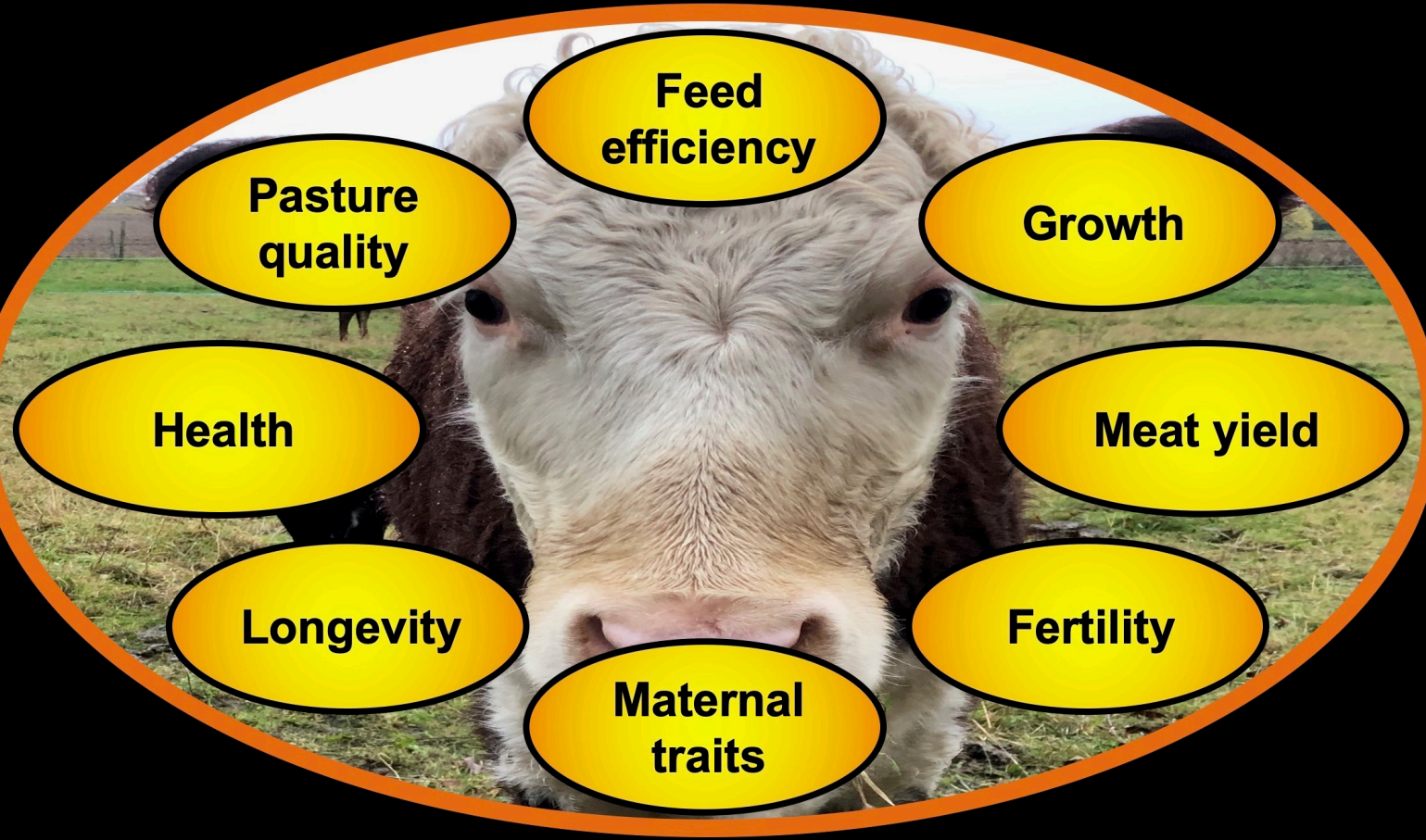


Beef & Lamb AgriLeader

Source: Created by Dr. Jude L. Capper, 2022. Data from Quinton et al. (2018) Predicted economic and greenhouse gas benefits from using improved maternal genetics in UK beef cattle. Proceedings of the World Congress on Genetics Applied to Livestock Production, 11.364

B

# Improving key performance indicators reduces environmental impacts



Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



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

B

## 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.



**Jude Capper, PhD**

**@bovidiva**



**Beef & Lamb AgriLeader**

B

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



Animals: 45%



Manure: 36%



Crop inputs: 11%



Feed: 7%



Other: 1%



Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader



Source: Created by Dr. Jude L. Capper, 2021. Data from Jones et al. (2014) Journal of Agricultural Science: 152, 288–308.

B

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**

**Jude Capper, PhD**  
**@bovidiva**



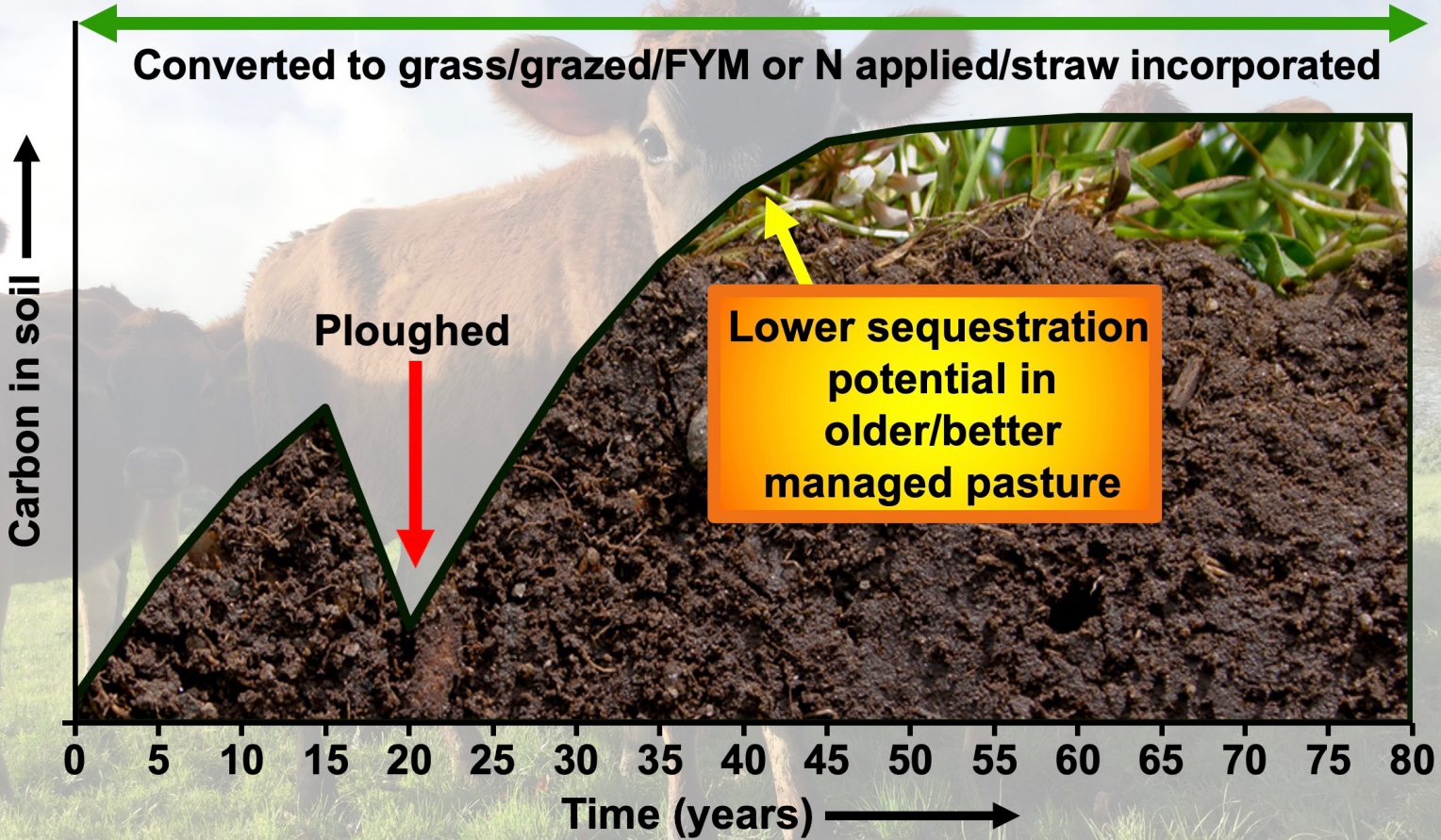
**Beef & Lamb AgriLeader**



Source: Created by Dr. Jude L. Capper, 2021. Data from Jones et al. (2014) Journal of Agricultural Science: 152, 288–308.

s

# Carbon sequestration offers promise – but isn't a magic bullet



Source: Created by Dr. Jude L. Capper, 2020 as an example of soil carbon sequestration. Data from: Poulton et al. (2017) *Global Change Biology*.

Jude Capper, PhD  
@bovidiva



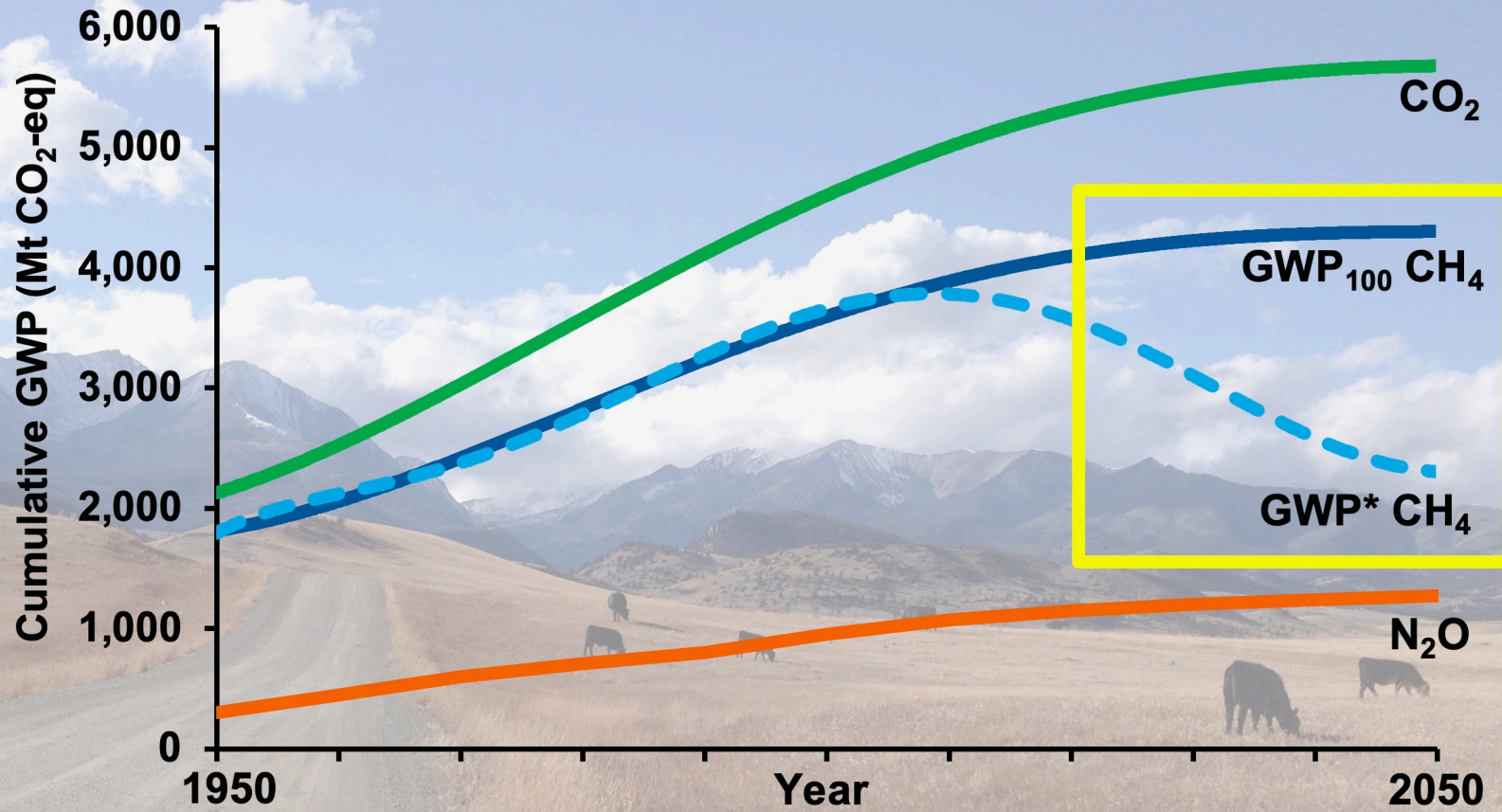
Beef & Lamb AgriLeader





s

# Under GWP\*, methane may contribute to global cooling



Source: Created by Dr. Jude L. Capper, 2022. Graph adapted from Allen et al. (2019) Agricultural Emissions on a Path to Net Zero. Available at: <https://www.slideshare.net/Sustainablefoodtrust/myles-allen-154983406>

Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader



B

Sustainability indices will be increasingly present on meat labels in future

### Beef (animal-based) patty

Nutritional value\*

Serving size: 227 g (8 oz) steak

78%

Pure beef protein  
- contains no  
lab-based  
ingredients!

Sustainability index



Carbon footprint (under GWP\*)



Water footprint



Antibiotic footprint



Community support rating



Farm webcam and sustainability assessment data



\*compared to ideal protein



Jude Capper, PhD  
@bovidiva

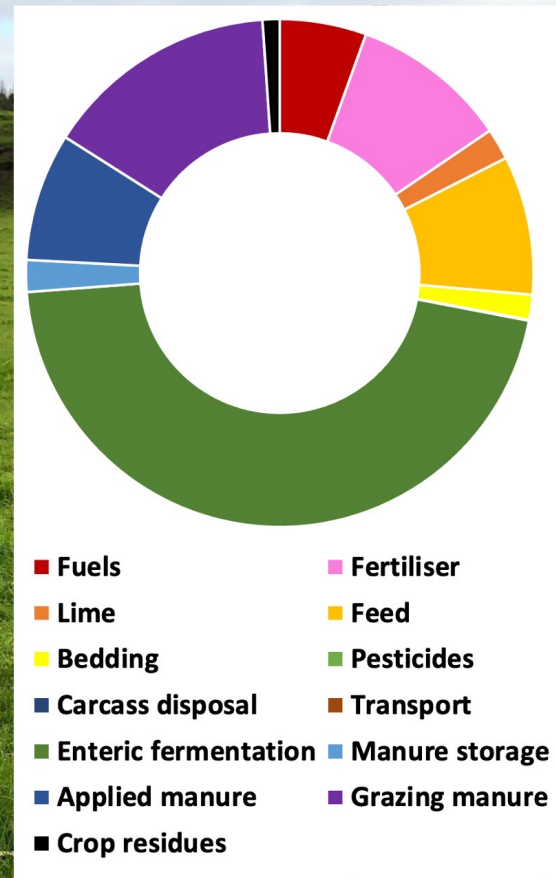
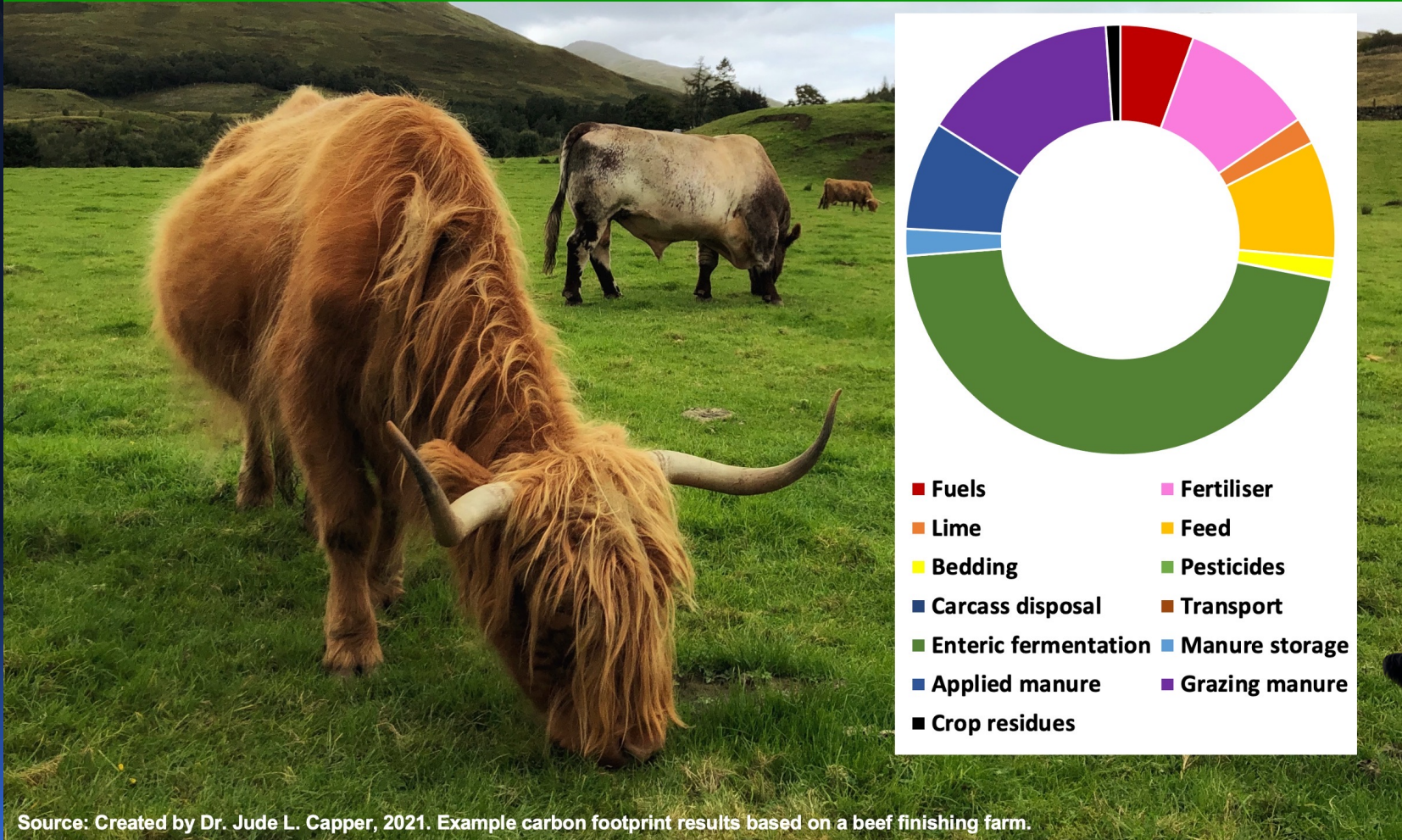


Beef & Lamb AgriLeader

S

# Standard footprinting tool urgently needed across the industry

Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader



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

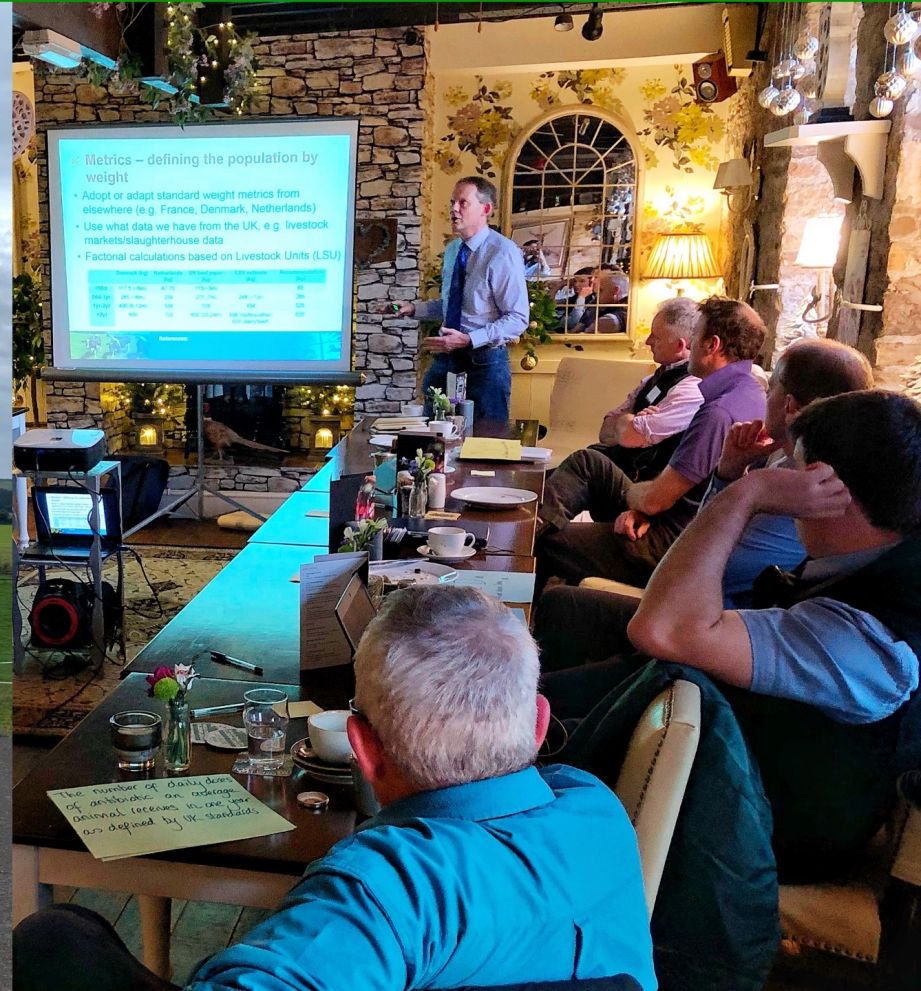
s

# Peer-to-peer learning, discussion groups and farmer incentives aid behavioural change

Jude Capper, PhD  
@bovidiva



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



Metrics – defining the population by weight

- Adopt or adapt standard weight metrics from elsewhere (e.g. France, Denmark, Netherlands)
- Use what data we have from the UK, e.g. livestock markets/slaughterhouse data
- Factorial calculations based on Livestock Units (LSU)

| Species  | Weight (kg) | LSU     |
|----------|-------------|---------|
| 1000 kg  | 1000        | 1.0     |
| 500 kg   | 500         | 0.5     |
| 250 kg   | 250         | 0.25    |
| 125 kg   | 125         | 0.125   |
| 62.5 kg  | 62.5        | 0.0625  |
| 31.25 kg | 31.25       | 0.03125 |

The number of animals of a certain breed or variety of animal increases in size, as defined by its standards.

Beef & Lamb AgriLeader



COM

Do 582,538 Veganuary participants amount to more than a hill of beans?

**JOIN THE  
NEW YEAR'S  
REVOLUTION**



- Slightly smaller than the population of Sheffield
- If all participants were UK-based they would comprise <1% of the UK population
- Average of 2,787 per participating country
- 62% of participants already vegan, vegetarian or pescatarian

Source: Created by Dr. Jude L. Capper, 2021. Information from: <https://veganuary.com/>

Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



COM

# 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%**



**Jude Capper, PhD**  
**@bovidiva**



**Beef & Lamb AgriLeader**



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?](https://yougov.co.uk/topics/resources/articles-reports/2019/03/18/future-food-flexitarian)

COM

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

Animal welfare

Healthiness

Environment

Labelling

Economic cost



*“Which, if any, of the following factors might encourage you to adopt a vegan/vegetarian diet?”*

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>

Jude Capper, PhD  
@bovidiva



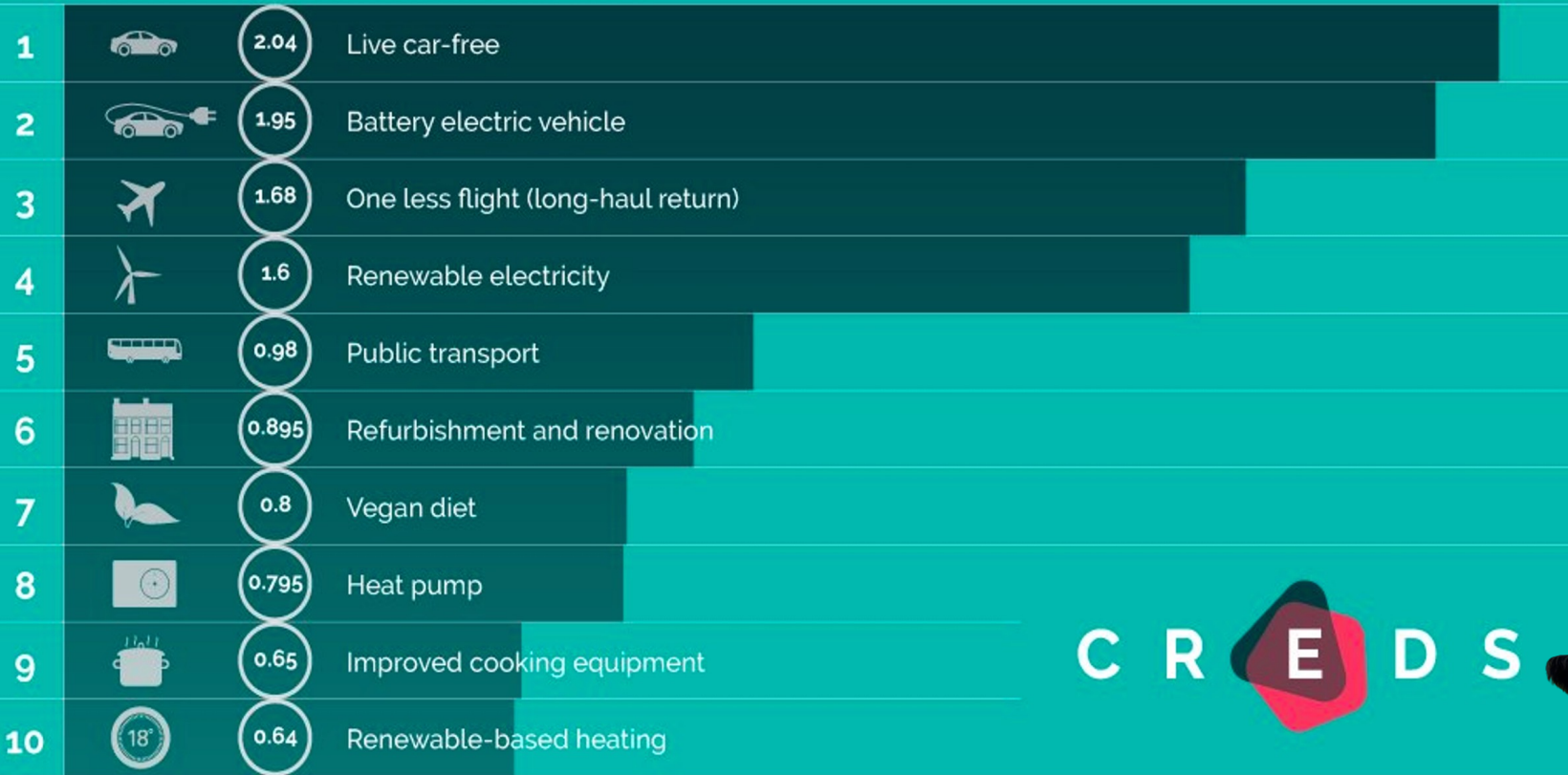
Beef & Lamb AgriLeader



CV

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

## Top 10 options for reducing your carbon footprint



Jude Capper, PhD  
@bovidiva



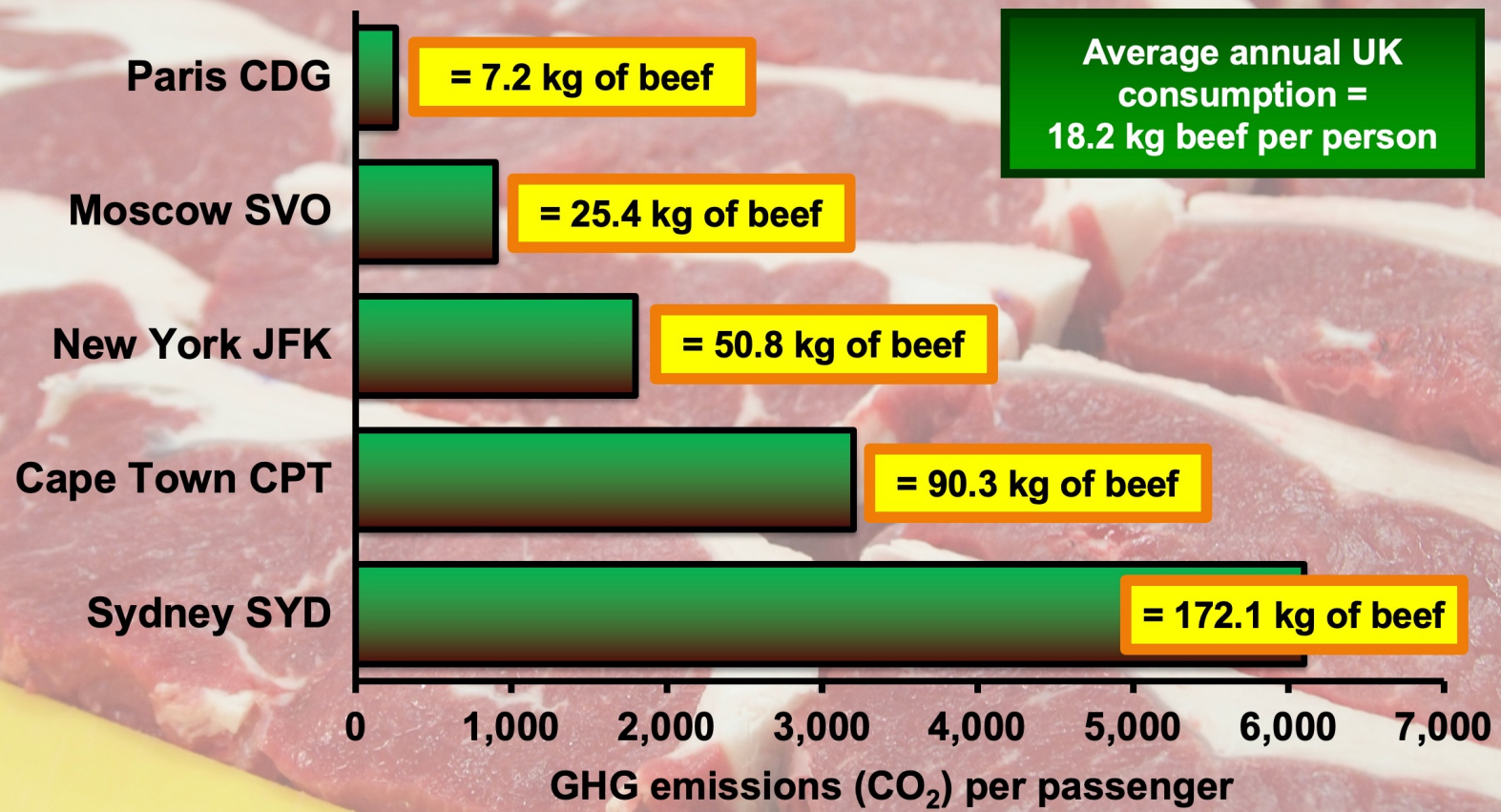
Beef & Lamb AgriLeader

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



CV

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



Source: Created by Dr. Jude L. Capper, 2020. Calculations based on GHG emissions flight data from: [https://co2.myclimate.org/en/flight\\_calculators/new](https://co2.myclimate.org/en/flight_calculators/new), and on a carbon footprint per kg of boneless beef of 35.5 kg CO<sub>2</sub>-eq (under GWP100) from AHDB: [http://beefandlamb.ahdb.org.uk/wp-content/uploads/2013/05/p\\_cp\\_down\\_to\\_earth300112.pdf](http://beefandlamb.ahdb.org.uk/wp-content/uploads/2013/05/p_cp_down_to_earth300112.pdf)

Jude Capper, PhD  
@bovidiva

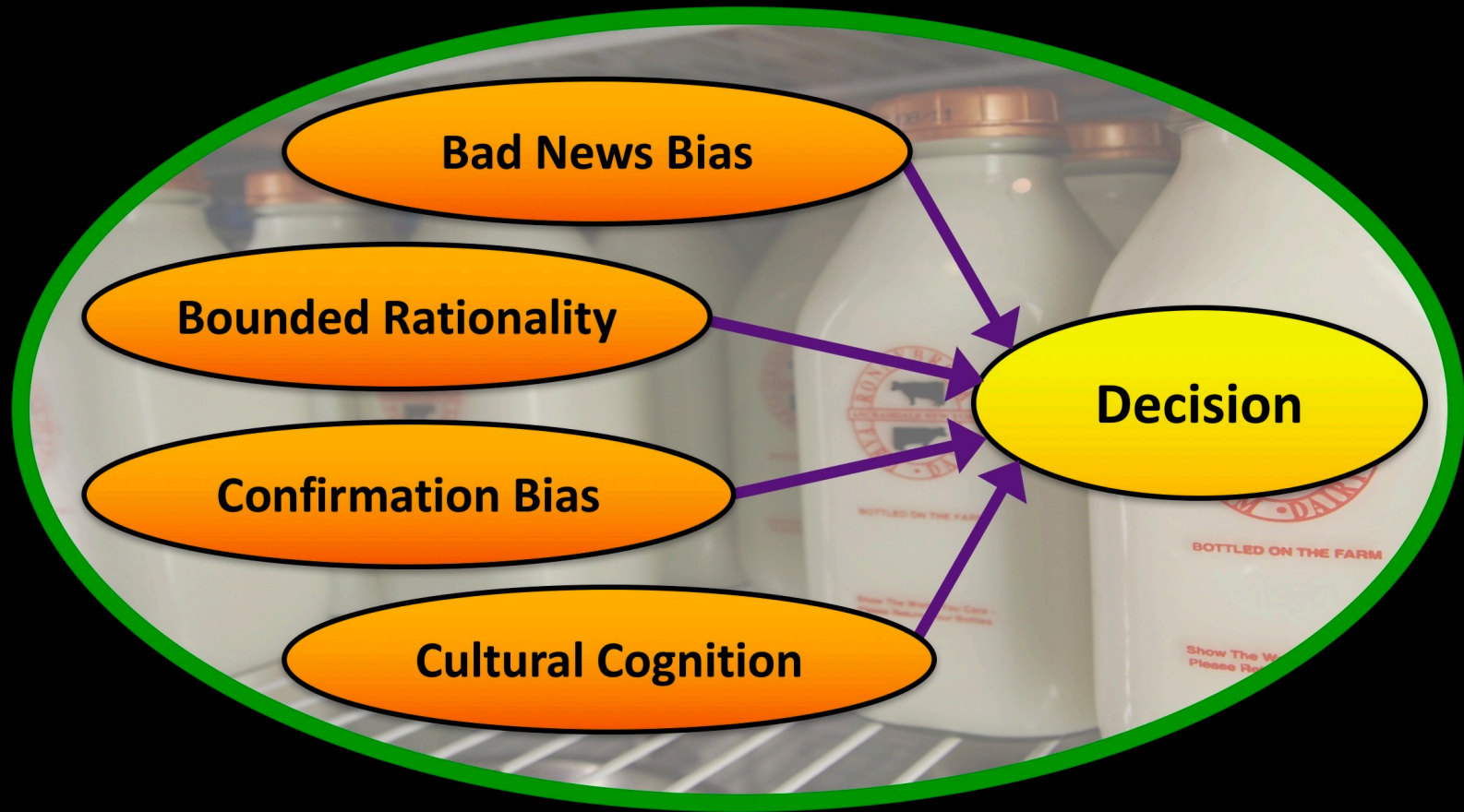


Beef & Lamb AgriLeader



COM

# Four major processes influence consumer decision-making



Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



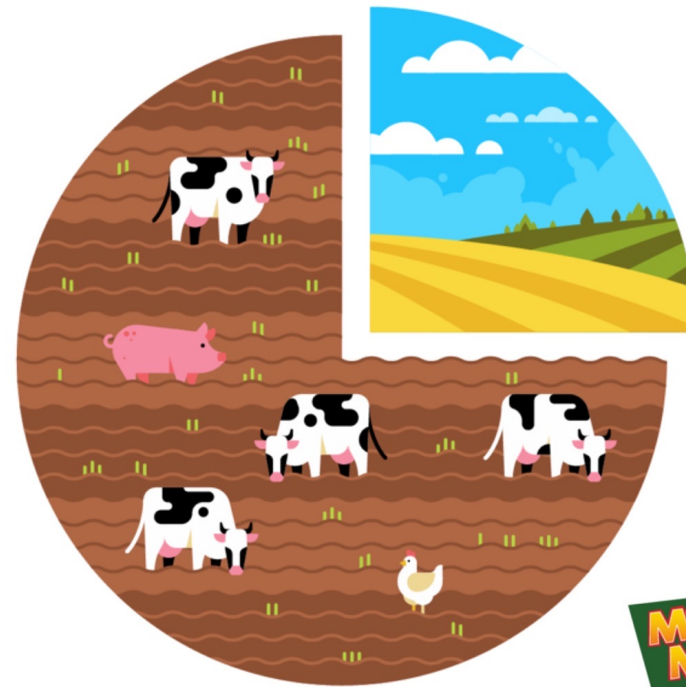
Source: Created by Dr. Jude L. Capper, 2017. Information from: Capper and Yancey (2015). Communicating Animal Science to the General Public. *Animal Frontiers*.

COM

Bad news bias – need five positive stories to cancel out each negative

We are programmed to believe bad news stories. Tidal wave of factual information needed to overcome them.

LIVESTOCK PRODUCTION USES 75% OF THE EARTH'S AGRICULTURAL LAND.



MEATLESS MONDAY

Jude Capper, PhD  
@bovidiva



Source: Created by Dr. Jude L. Capper, 2020. Infographic from: <https://www.pinterest.co.uk/pin/254383078939543245/>

Beef & Lamb AgriLeader



S

# Can we grow human food crops everywhere?



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

Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



S

65% of UK land is not suitable for growing arable crops



Source: Created by Dr. Jude L. Capper, 2020. Grazing land includes temporary grass on arable land (6% of total), land used for outdoor pigs or non-agricultural purposes not shown (1.7% of total). Data from DEFRA. 2019. Farming statistics - provisional crop areas, yields and livestock populations at 1 June 2019 – United Kingdom.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/837834/structure-jun2019prov-UK-10oct19.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/837834/structure-jun2019prov-UK-10oct19.pdf)

Jude Capper, PhD  
@bovidiva

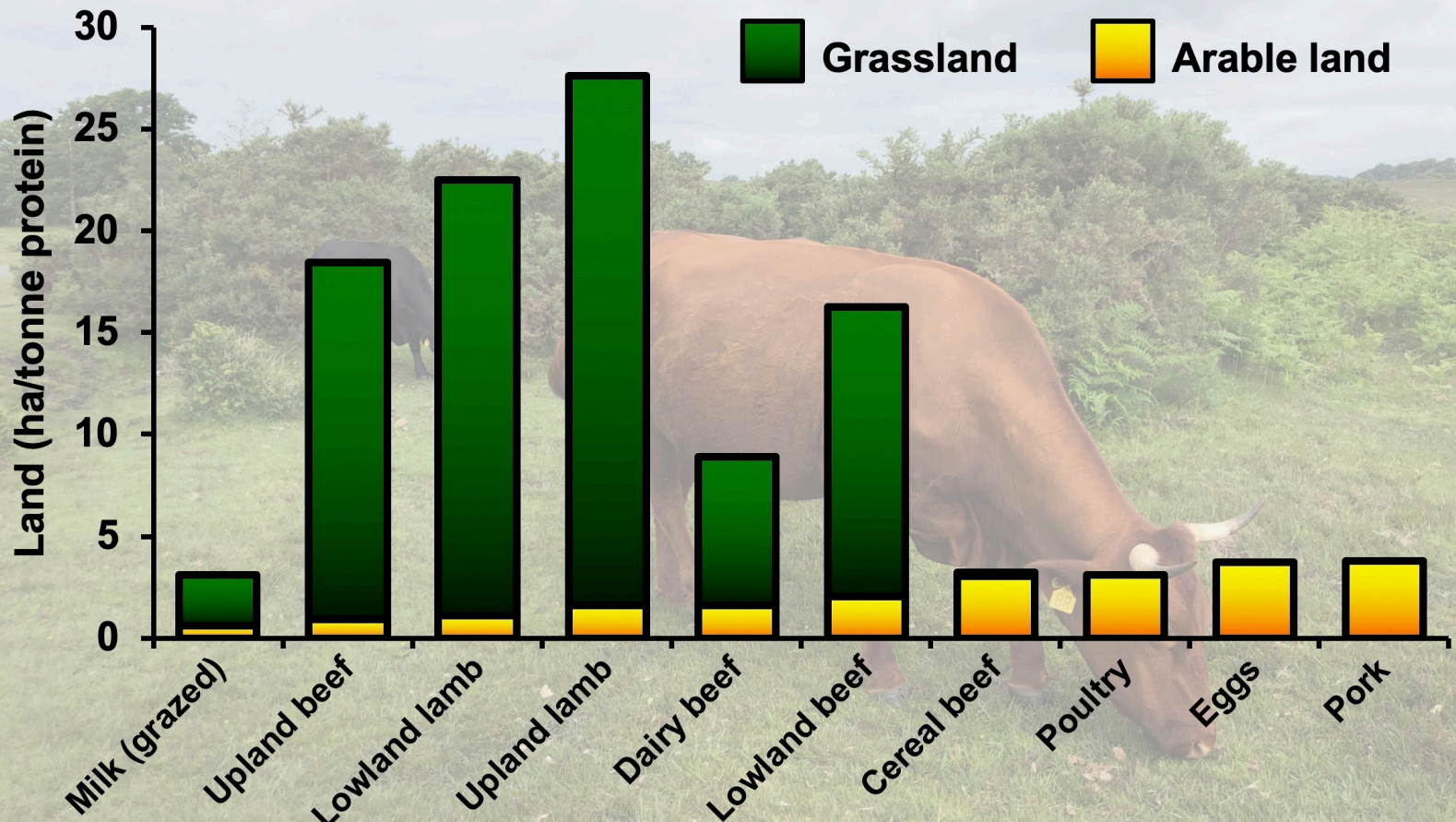


Beef & Lamb AgriLeader



s

# Livestock systems vary widely in arable and grassland use



Source: Created by Dr. Jude L. Capper, 2020; data from Wilkinson and Lee (2018) Review: Use of human-edible animal feeds by ruminant livestock. *Animal*.

Jude Capper, PhD

@bovidiva

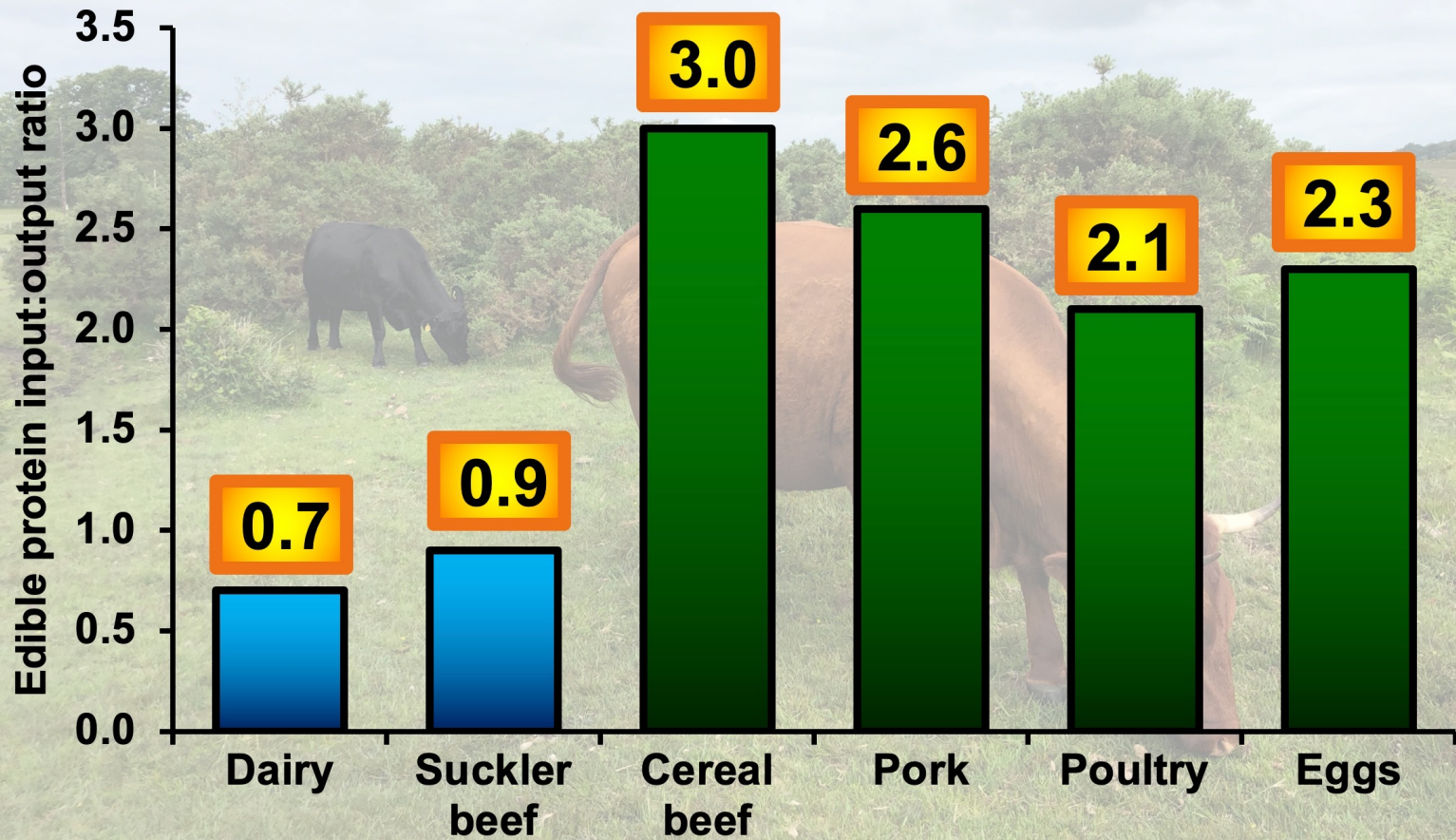


Beef & Lamb AgriLeader



s

# 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*.

Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



S

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




Jude Capper, PhD  
@bovidiva



Source: Created by Dr. Jude L. Capper, 2013

Beef & Lamb AgriLeader





COM

Bounded rationality - we don't have time to research, so need quick, simple explanations

Based on the average UK diet

30%

of our protein intake comes from red meat...

...which is vital for our body's growth, maintenance and muscle recovery!



Jude Capper, PhD

@bovidiva



Source: Created by Dr. Jude L. Capper, 2020. Infographic from HCC (2020): <https://meatpromotion.wales/en/news-industry-info/download>

Beef & Lamb AgriLeader

COM

## Confirmation bias – tapping into consumers' inherent beliefs to improve trust

Jude Capper, PhD

@bovidiva



Consumers may interpret bottle-feeding a calf as caring or cruel, depending on pre-conceived ideas

Beef & Lamb AgriLeader



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

COM

Cultural cognition – we trust people with whom we share values and wish to emulate

Jude Capper, PhD  
@bovidiva



England rugby player credited <3 week recovery from broken leg to drinking 2 pints of milk per day

Source: Created by Dr. Jude L. Capper, 2019. Screenshot from: <http://www.telegraph.co.uk/rugby-union/2017/02/02/england-prop-joe-marler-reveals-secret-behind-hisremarkable/>

The Telegraph

HOME | NEWS

## Sport | Rugby Union

Rugby Union | Fixtures | Results | Tables | Lions | Aviva Premiership | Brian Moore

Home > Sport > Rugby Union

### England prop Joe Marler reveals the secret behind his remarkable recovery in time for Six Nations

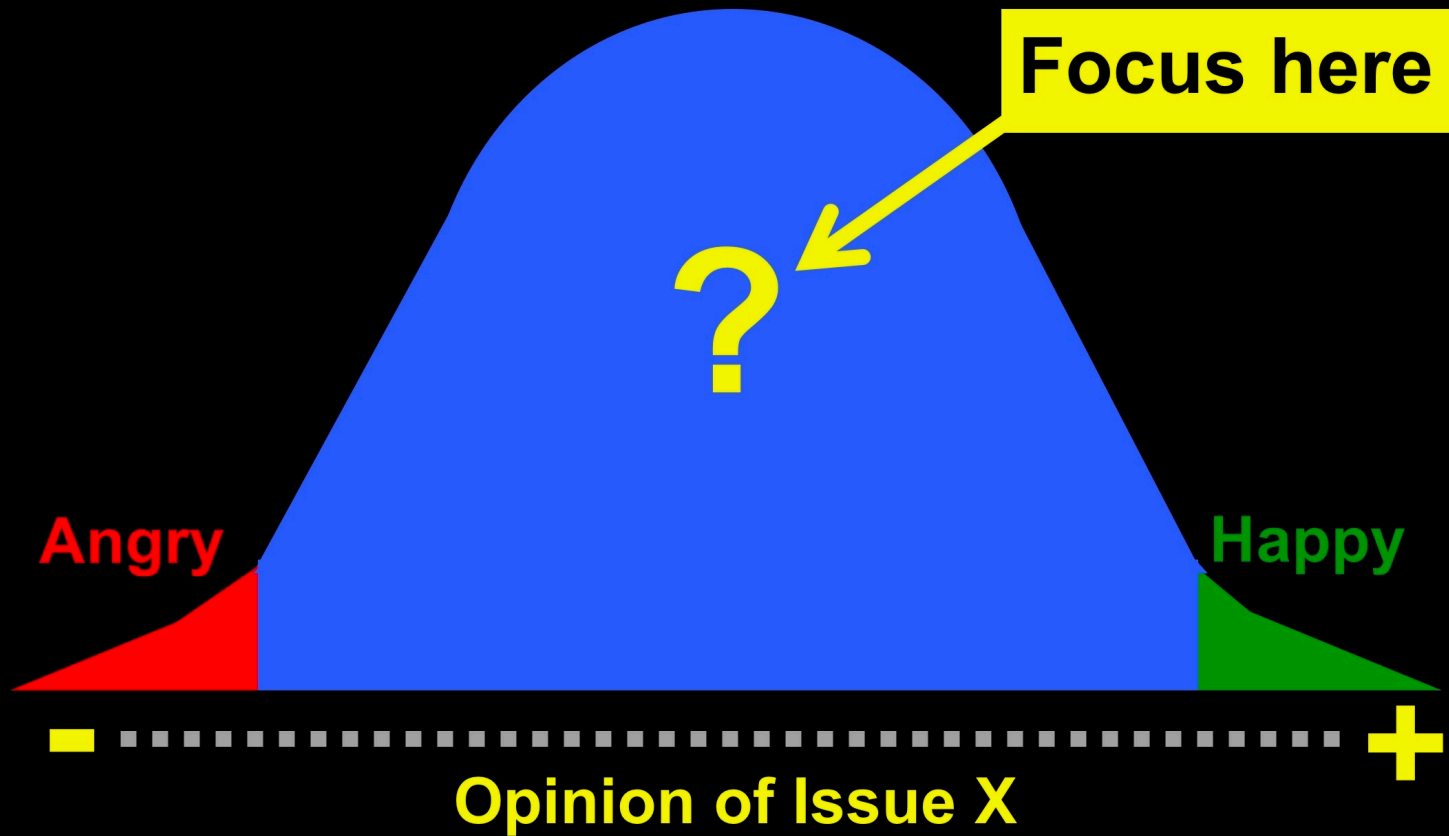


Beef & Lamb AgriLeader



COM

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



Jude Capper, PhD  
@bovidiva



Beef & Lamb AgriLeader



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

COM

## 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

Jude Capper, PhD

@bovidiva



Beef & Lamb AgriLeader



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

B

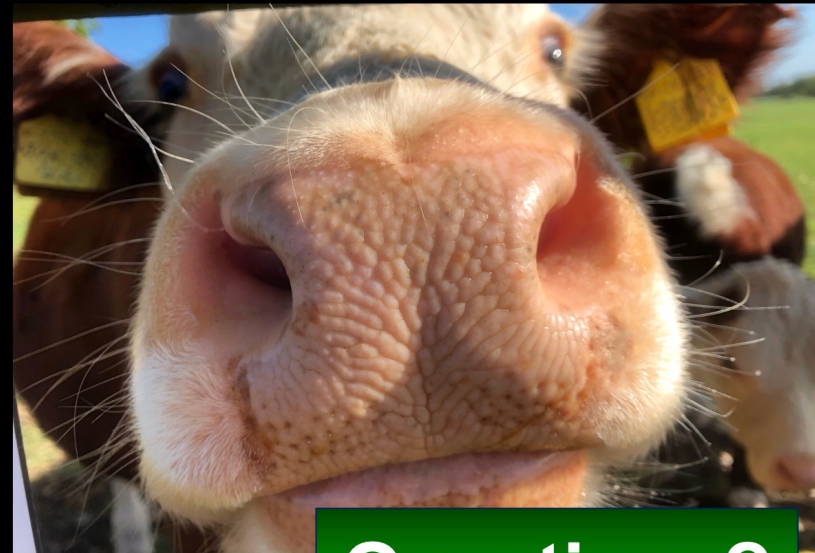
# Thank you!

[jude@livestocksustainability.com](mailto:jude@livestocksustainability.com)

<http://bovidiva.com/presentationlinks>

Jude Capper, PhD

@bovidiva



## Questions?



Beef & Lamb AgriLeader

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