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# Sustainable livestock farming – how do we implement this from the crops to the cow?

**Dr. Jude L. Capper .**

**25<sup>th</sup> March 2021**

Source: Dr. Jude L. Capper, 2021

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

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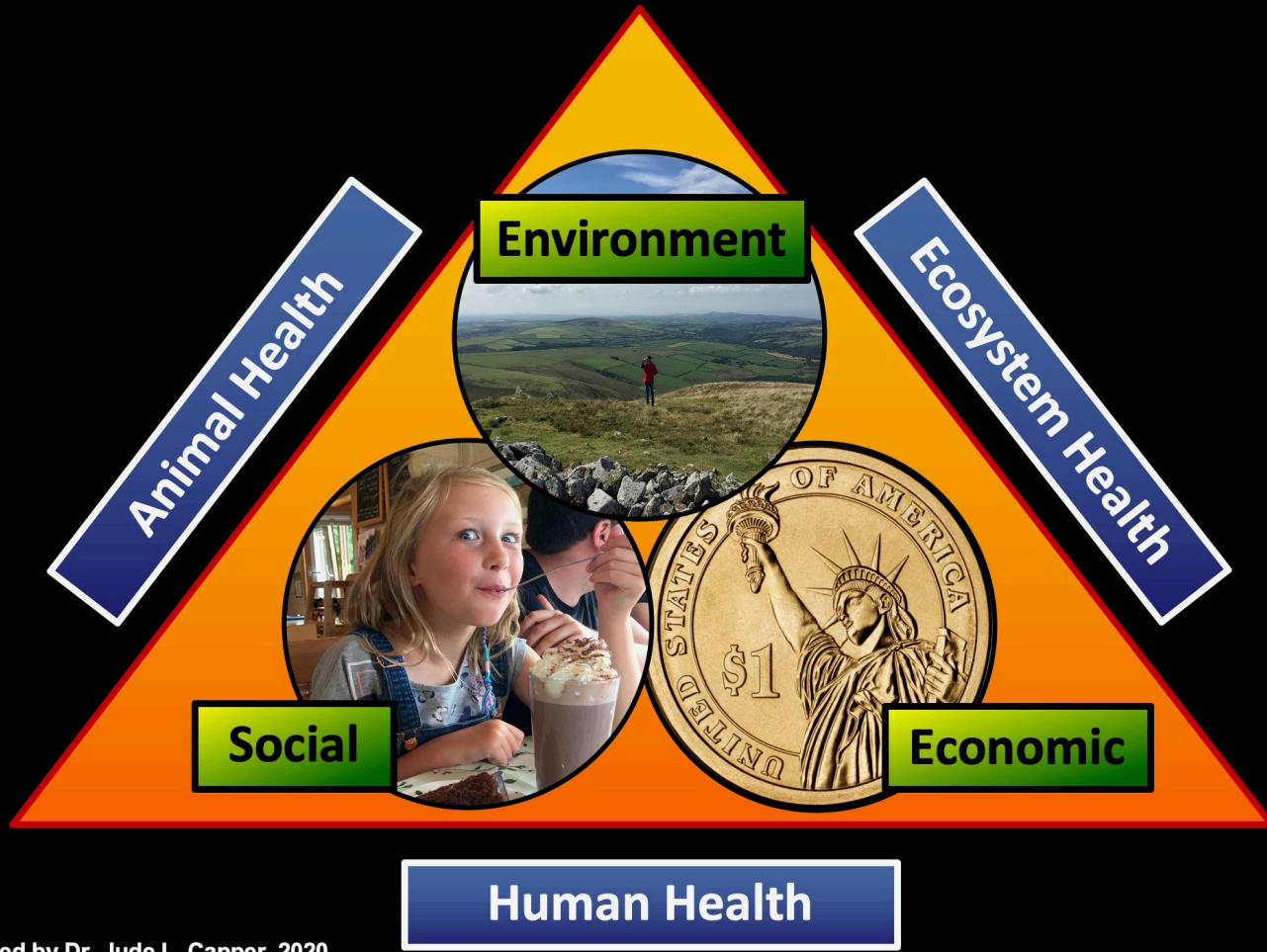
Source: Created and photos by Dr. Jude L. Capper, 2020

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



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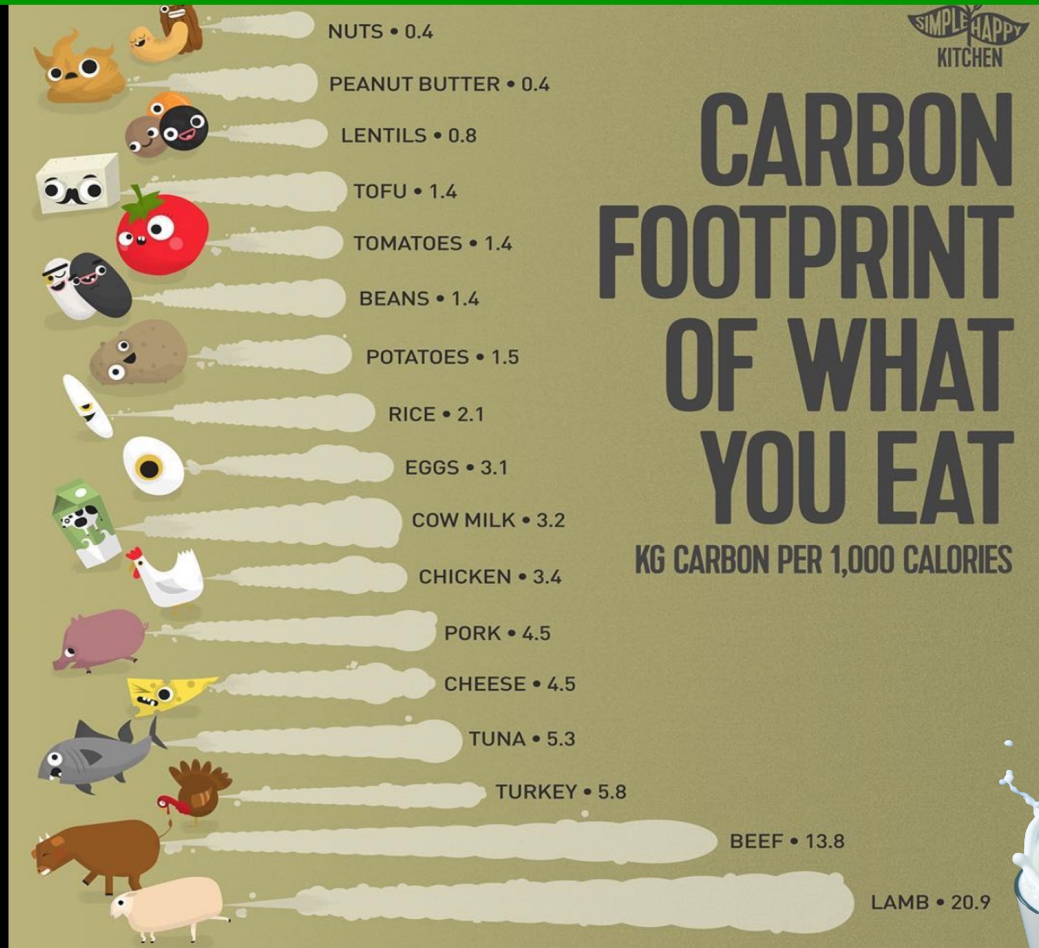
Source: Created by Dr. Jude L. Capper, 2020.

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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

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

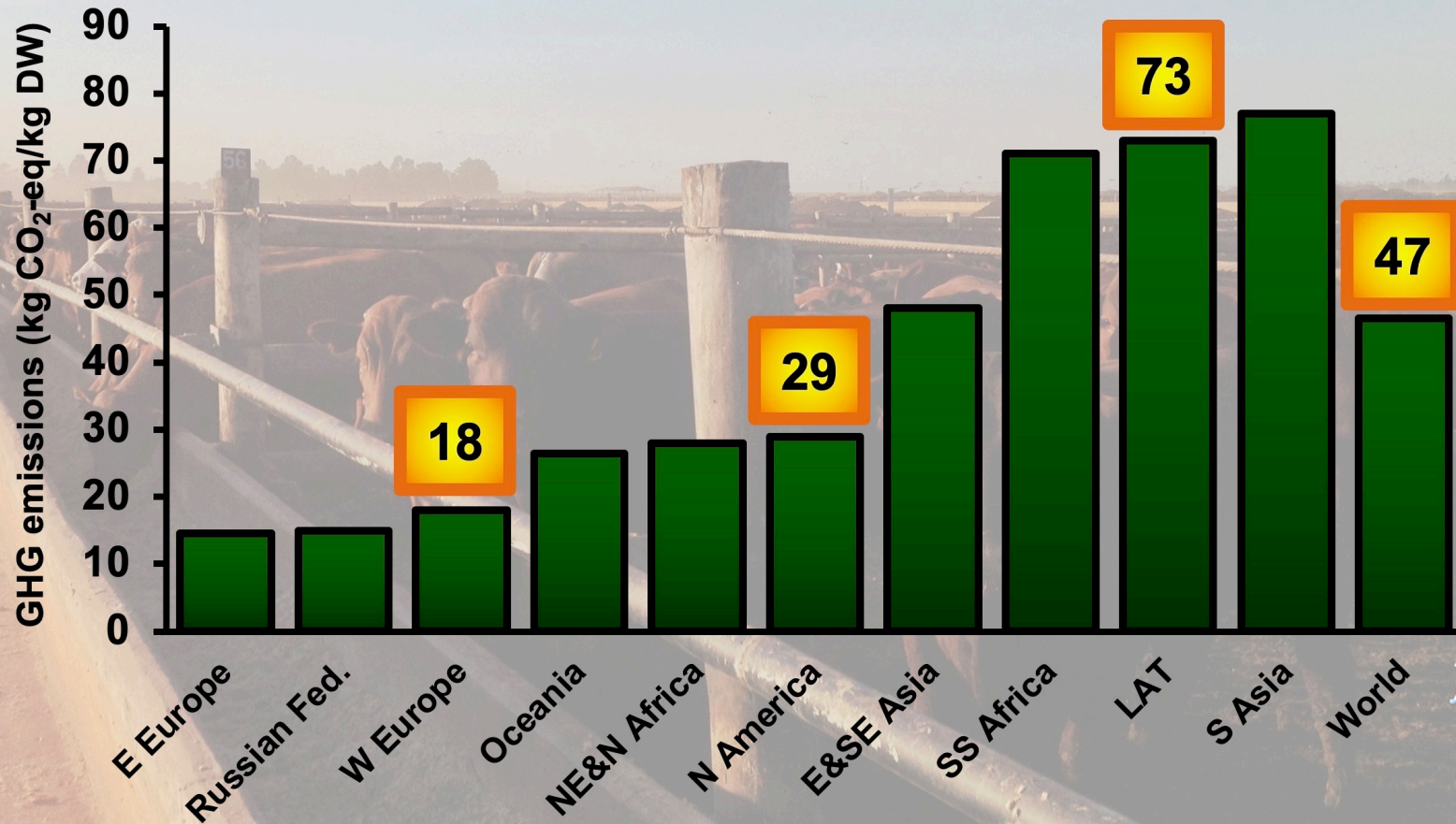


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## The carbon footprint of beef production varies across the globe



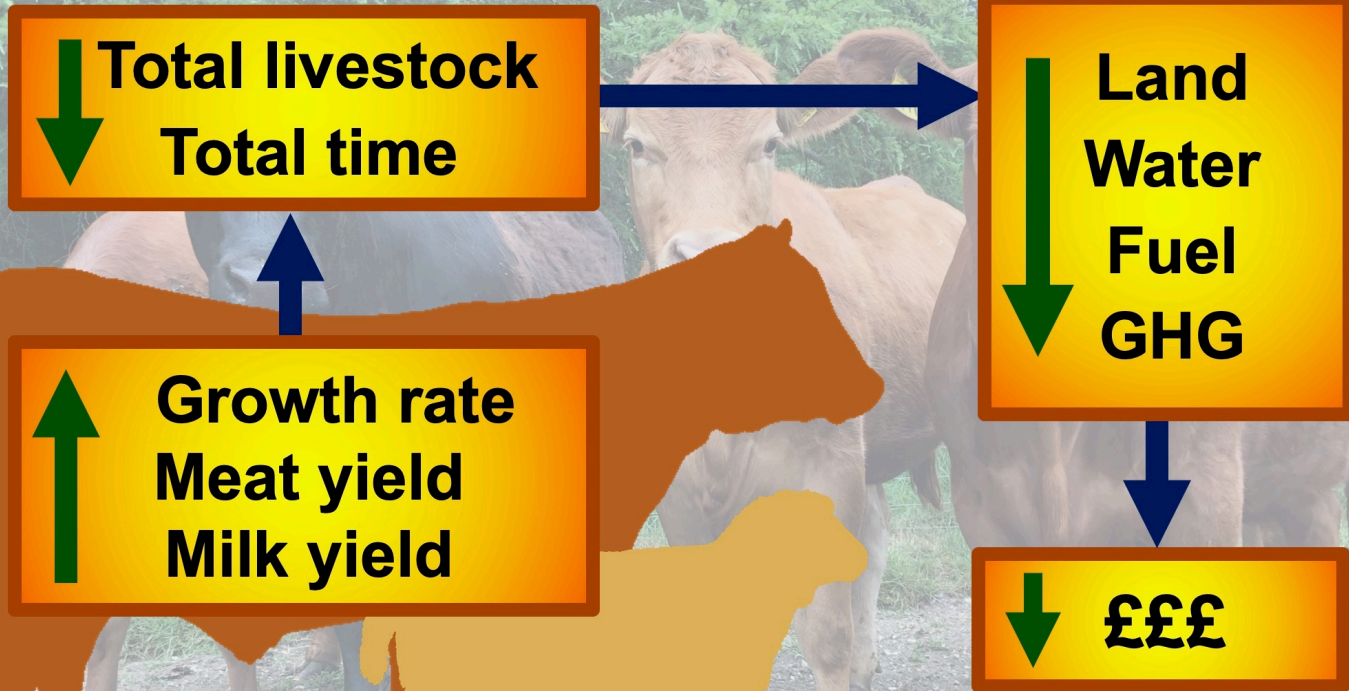
Source: Created by Dr. Jude L. Capper, 2020; data from Gerber et al. (2013) Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. FAO, Rome, Italy.

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



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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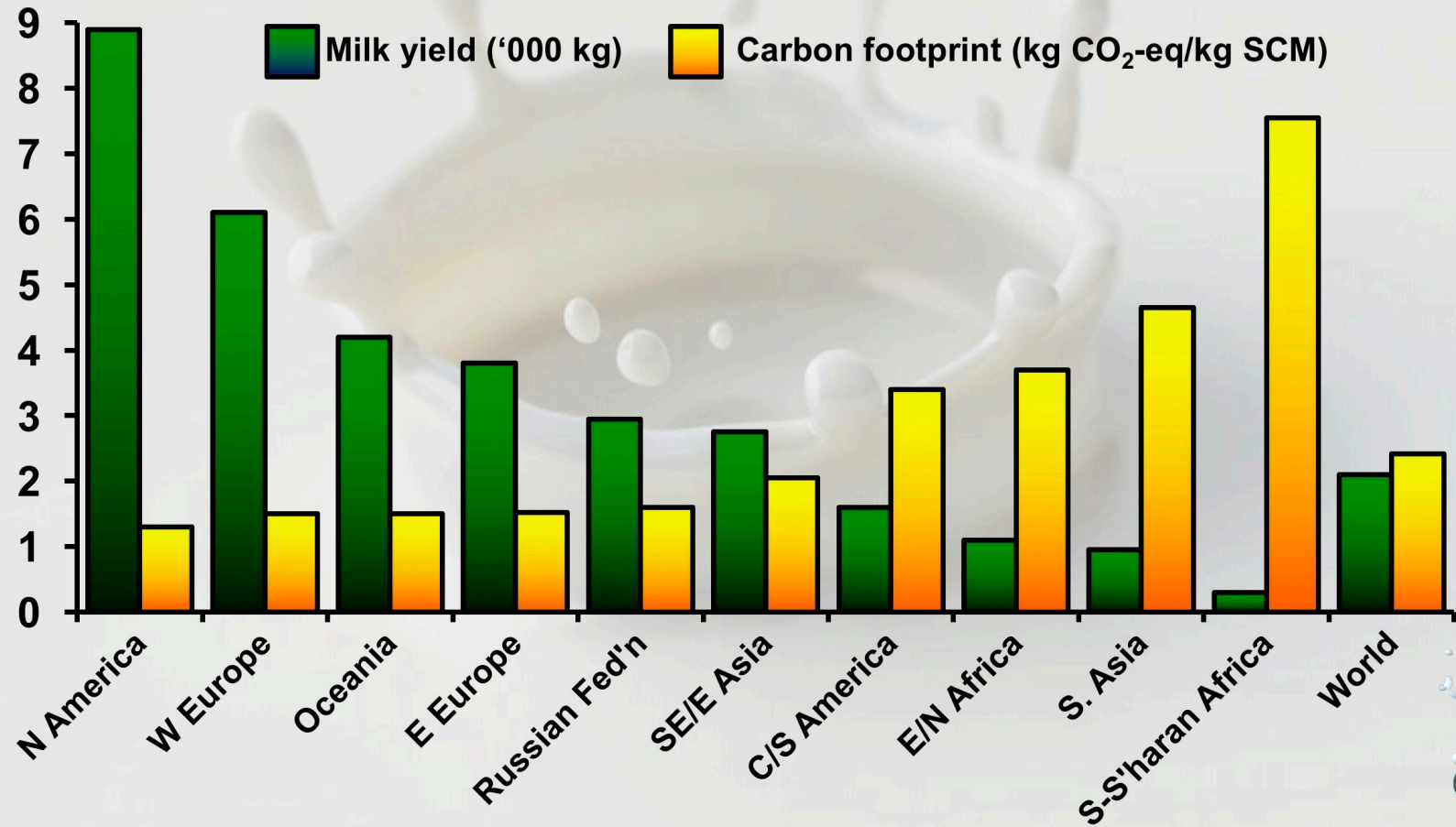


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# A negative correlation exists between milk yield and carbon emissions



Source: Created by Dr. Jude L. Capper, 2016; data from: FAO (2010) Greenhouse Gas Emissions from the Dairy Sector. FAO, Rome, Italy.

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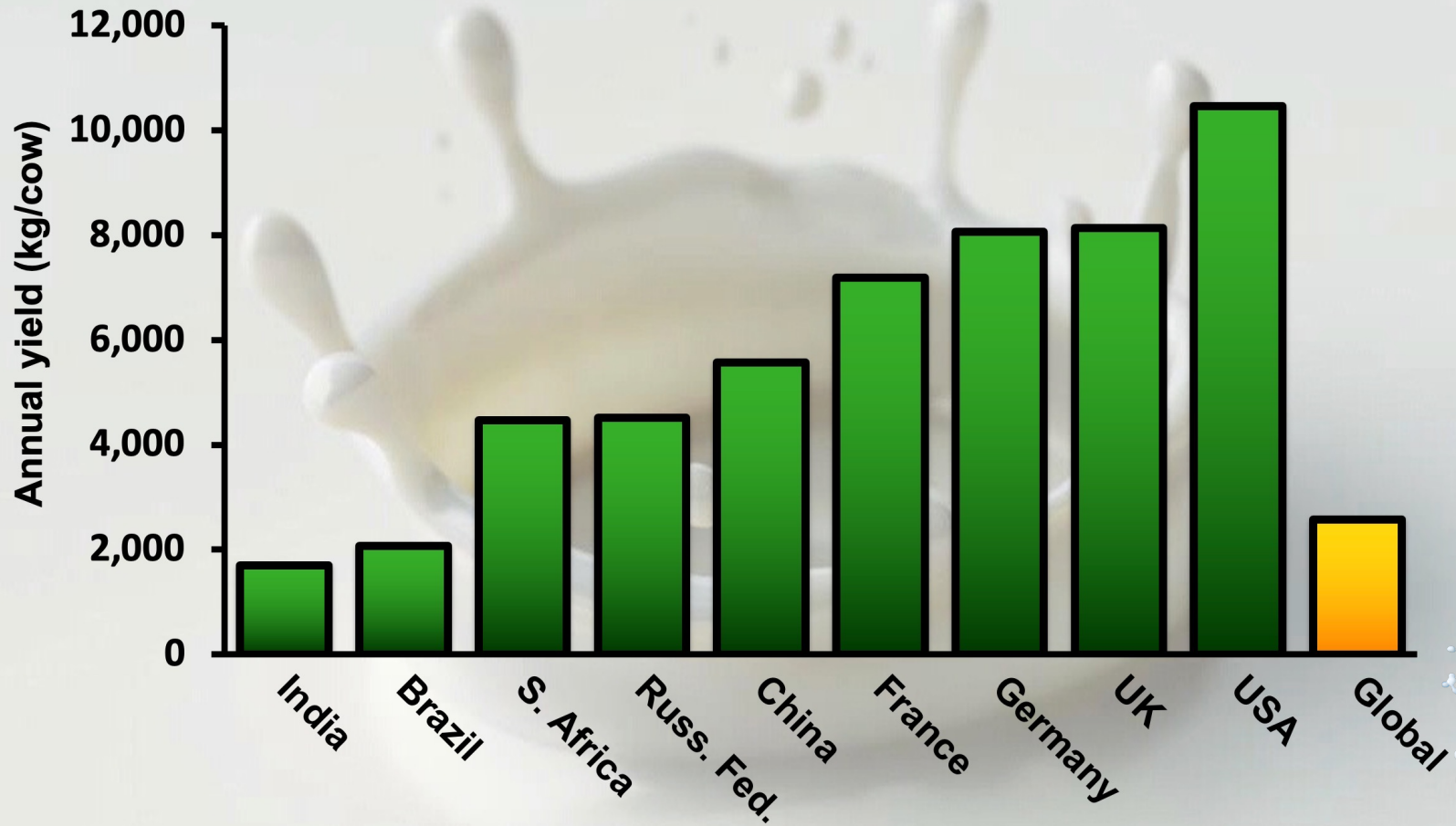
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## Improving global dairy productivity would cut environmental impacts



Source: Created by Dr. Jude L. Capper, 2020. Data from: FAOSTAT (2020) <http://www.fao.org/faostat/en/>

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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%)

Source: Created by Dr. Jude L. Capper, 2020. Data from: FAOSTAT (2020) <http://www.fao.org/faostat/en/>

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# Improving key performance indicators reduces environmental impact and economic cost

- Nutrition**
- Reproduction**
- Lameness**
- Mastitis**
- Metabolic disease**
- Infectious disease**
- Dry period length**
- Age at first calving**
- Antibiotic residues**
- Feed wastage**
- Pasture management**



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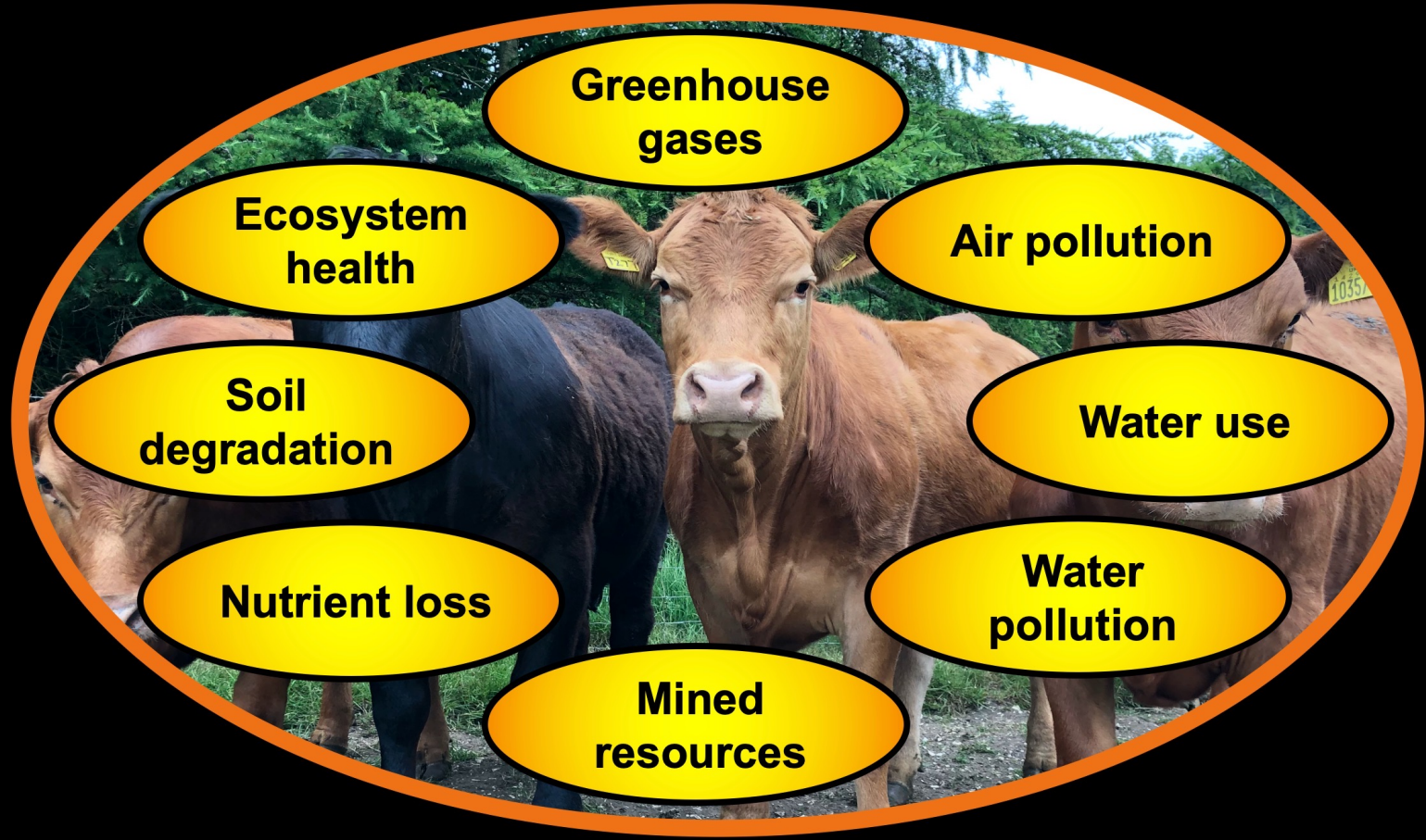
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Source: Created by Dr. Jude L. Capper, 2020

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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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# 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



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

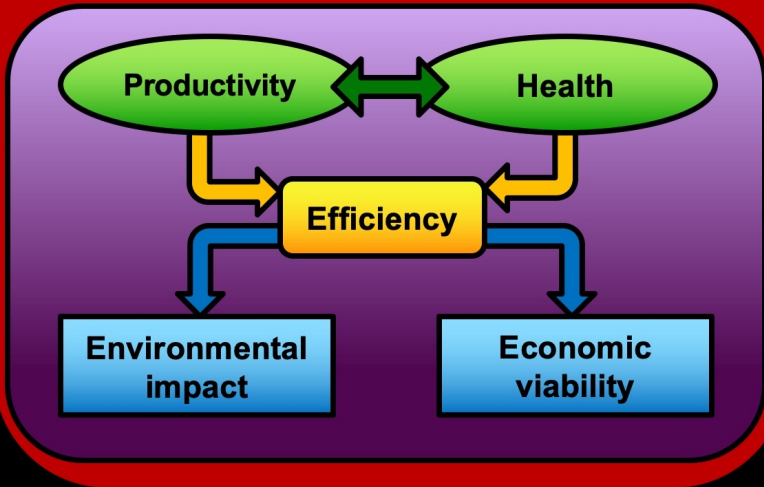
COM

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

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## Social Acceptability



## Sustainability



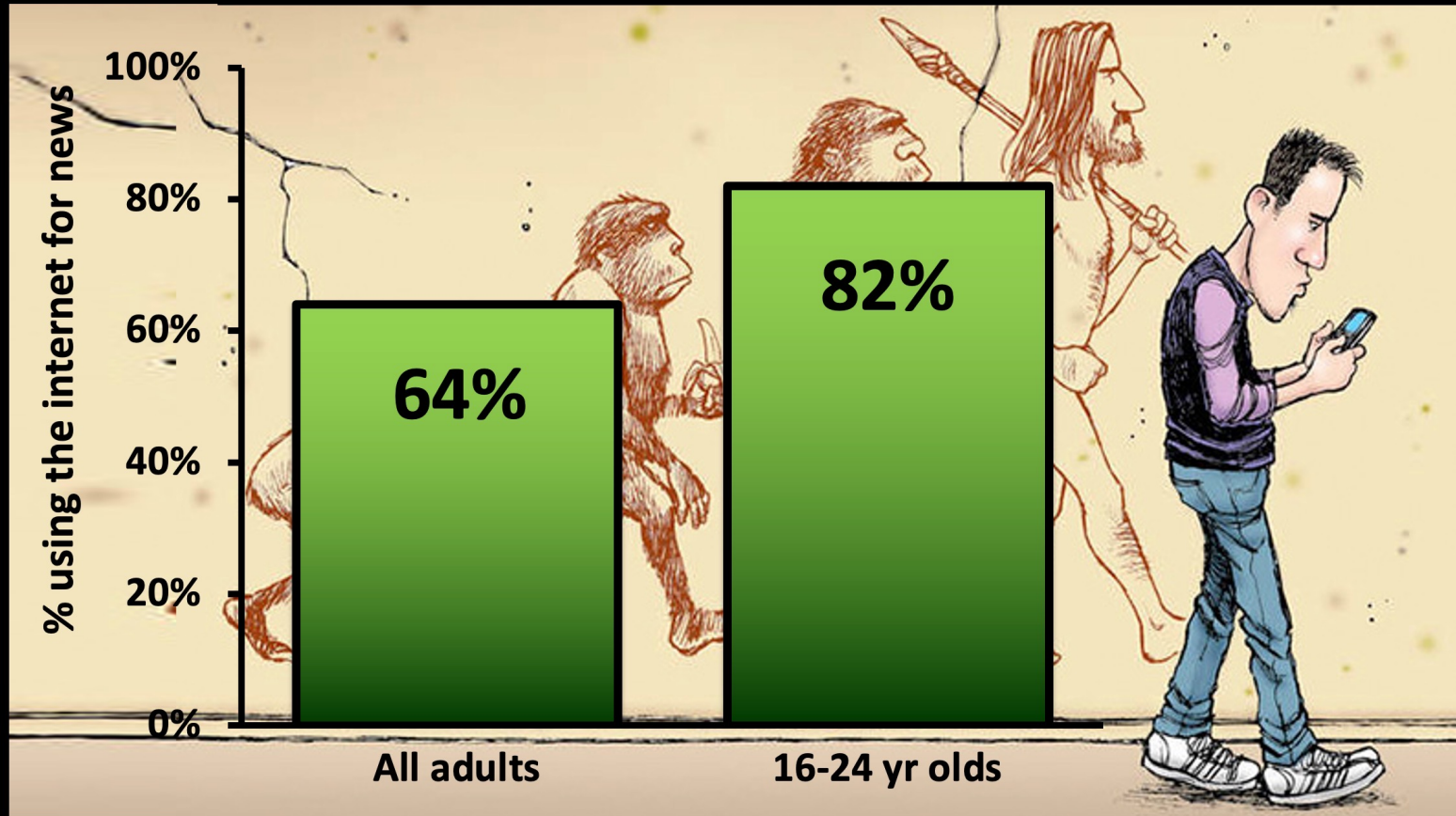
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Source: Created by Dr. Jude L. Capper, 2020.

AH

We now get a considerable amount of news from the internet

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Source: Created by Dr. Jude L. Capper, 2020. Cartoon from: <https://snipurl.im/huV0U> Data from: Ofcom. 2019. News Consumption in the UK: 2018. Available at: [https://www.ofcom.org.uk/data/assets/pdf\\_file/0024/116529/news-consumption-2018.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0024/116529/news-consumption-2018.pdf)

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Is the rise in plant-based food sales related to consumer demand?



Lockdown preparations in local food hall indicate that dairy may be a priority for many panic-buyers

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

# All foods have an environmental impact



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

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

**JOIN THE  
NEW YEAR'S  
REVOLUTION**



- Slightly greater than the population of Göteborg
- If all participants were based in Sweden they would comprise <6% of the Swedish 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/>

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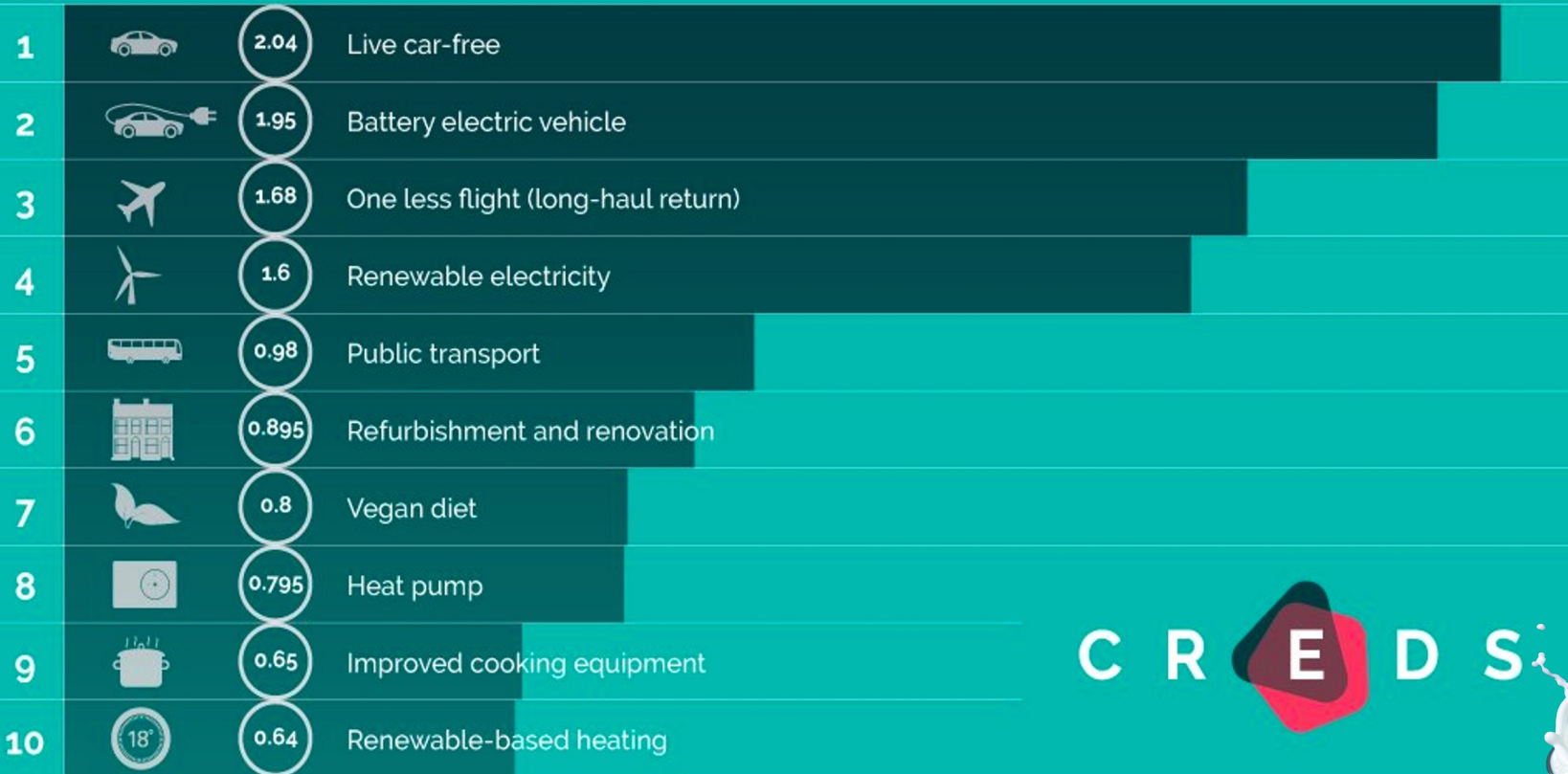
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# New CREDS report puts transport, energy and food choices into context

## Top 10 options for reducing your carbon footprint



CREDS

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)

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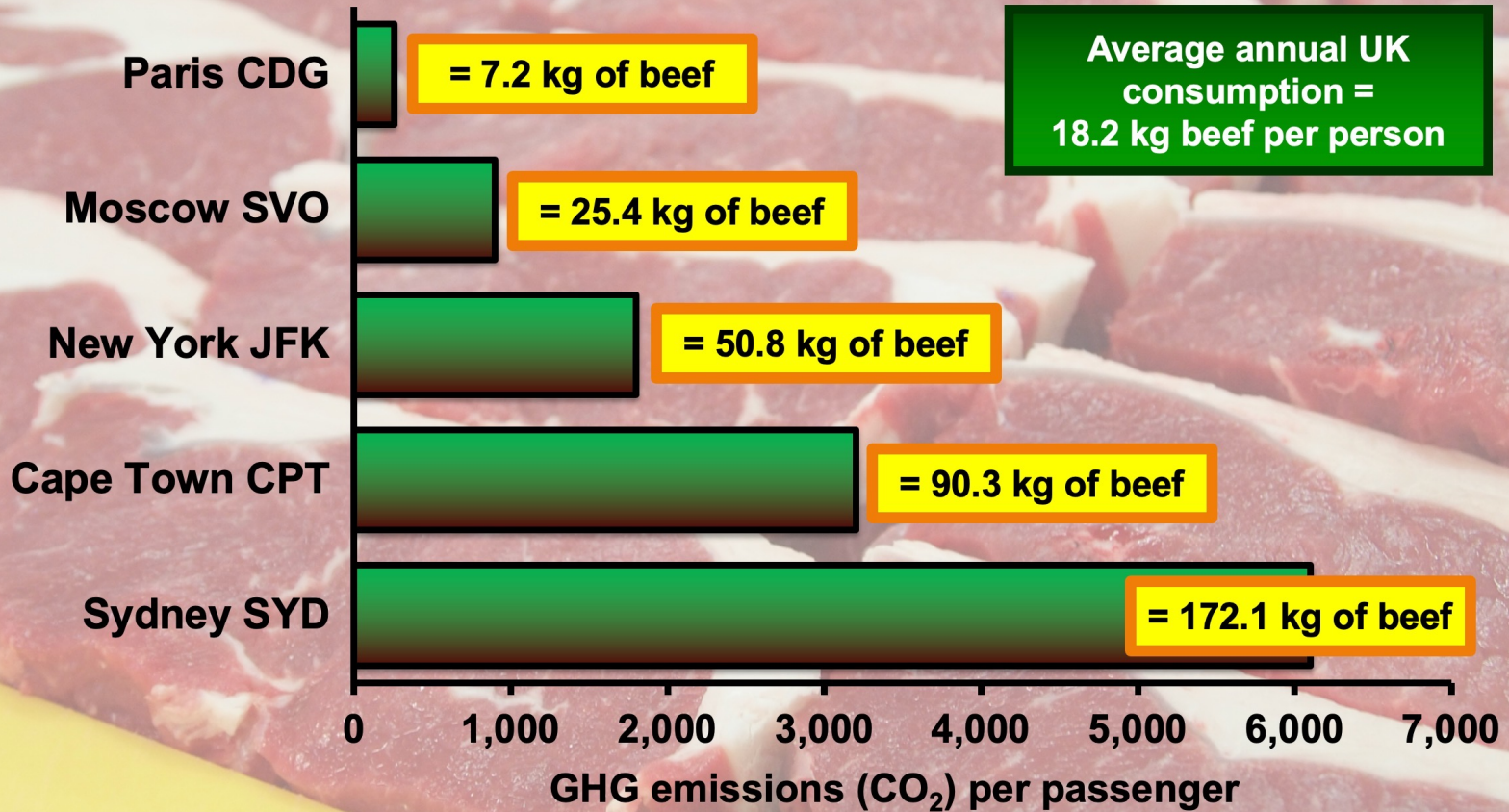


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# International flights emit considerable quantities of carbon compared to beef production



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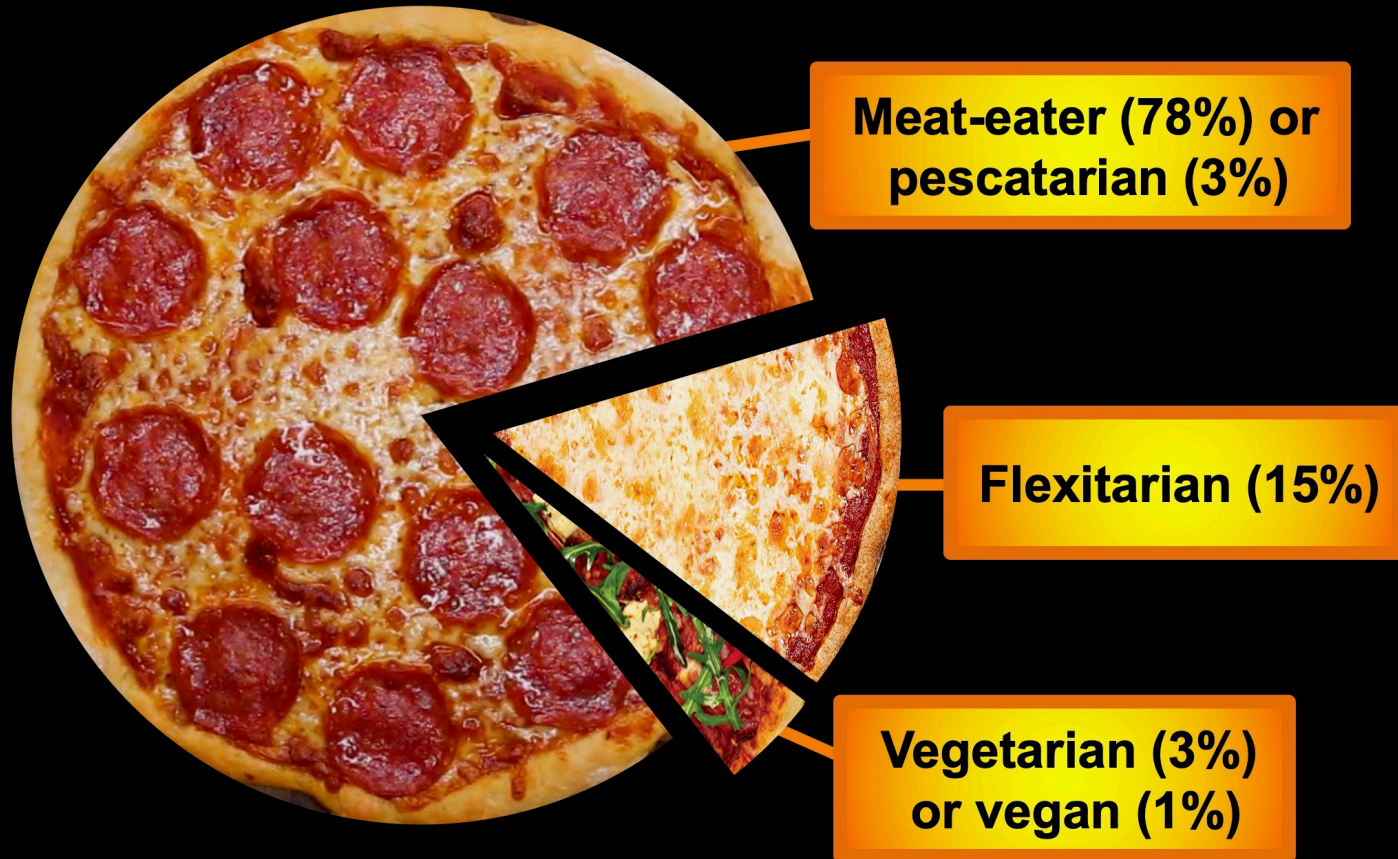
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Source: Created by Dr. Jude L. Capper, 2020. Calculations based on GHG emissions flight data from: [https://co2.myclimate.org/en/flight\\_calculators/new](https://co2.myclimate.org/en/flight_calculators/new), and on a carbon footprint per kg of boneless 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)



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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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# 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**

No guilt  
34%



Feel guilty  
66%

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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>

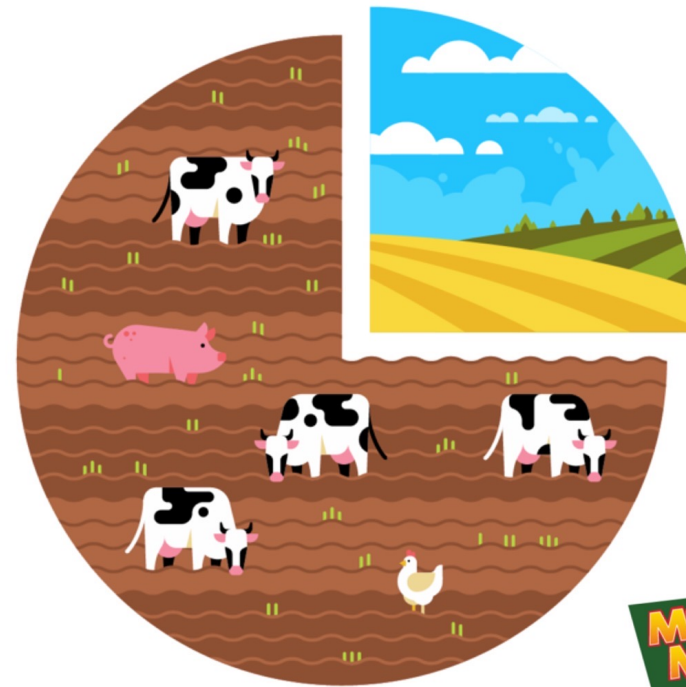


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Bad news bias – need five positive stories to cancel out each negative

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

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



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



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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)

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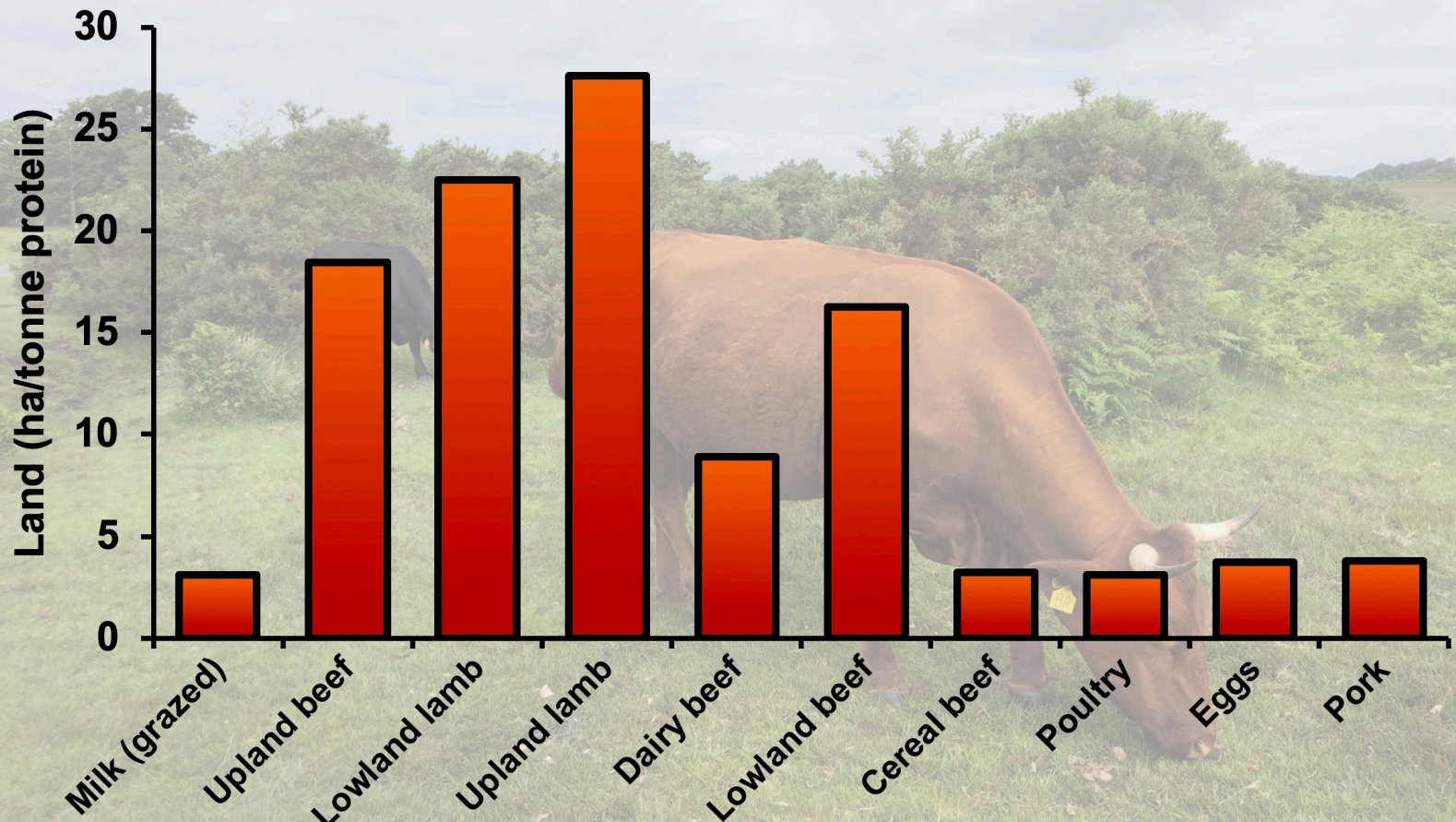
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# Livestock systems vary widely in land use



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*.

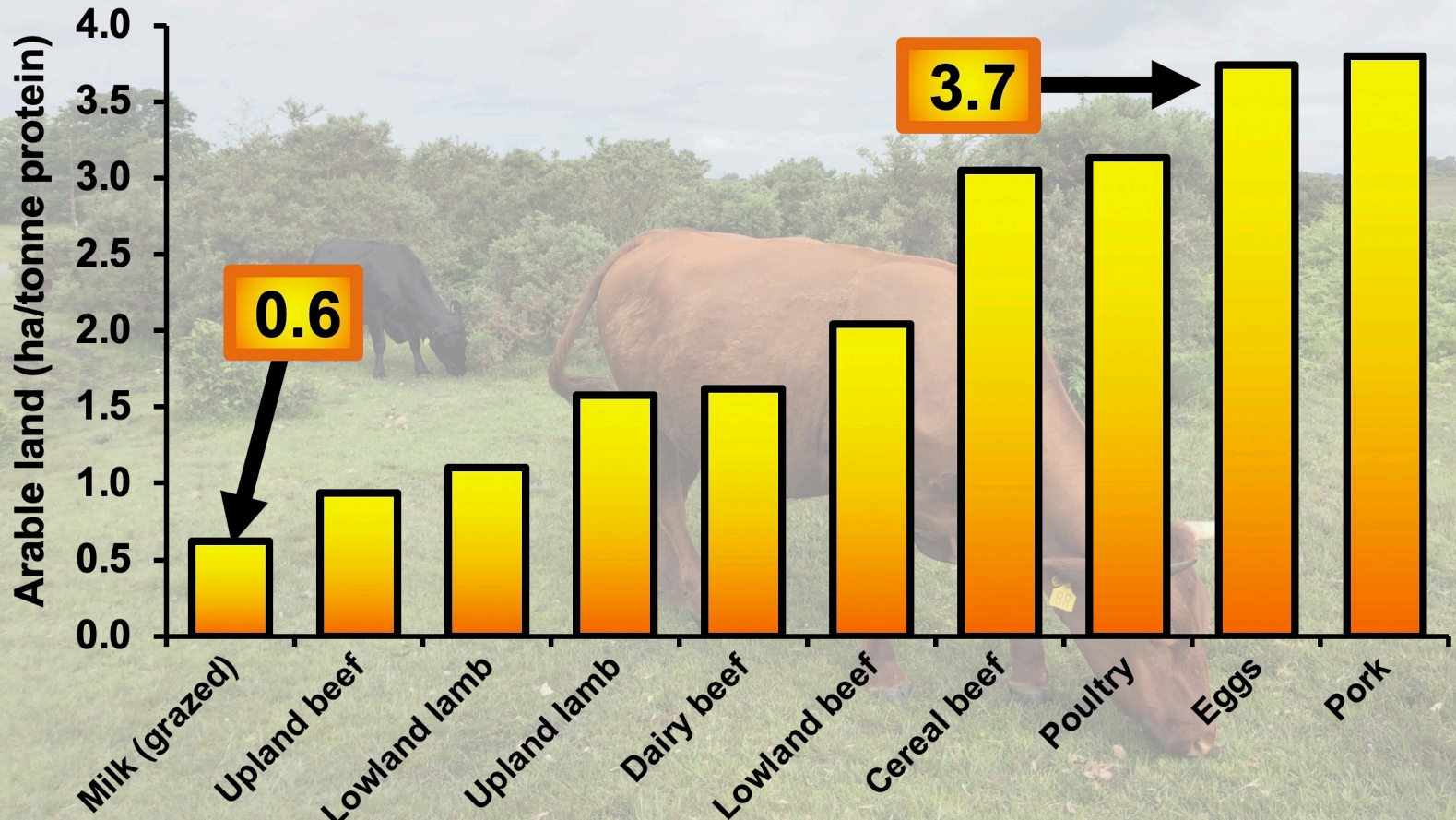
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# Livestock systems vary widely in arable land use



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*.

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



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

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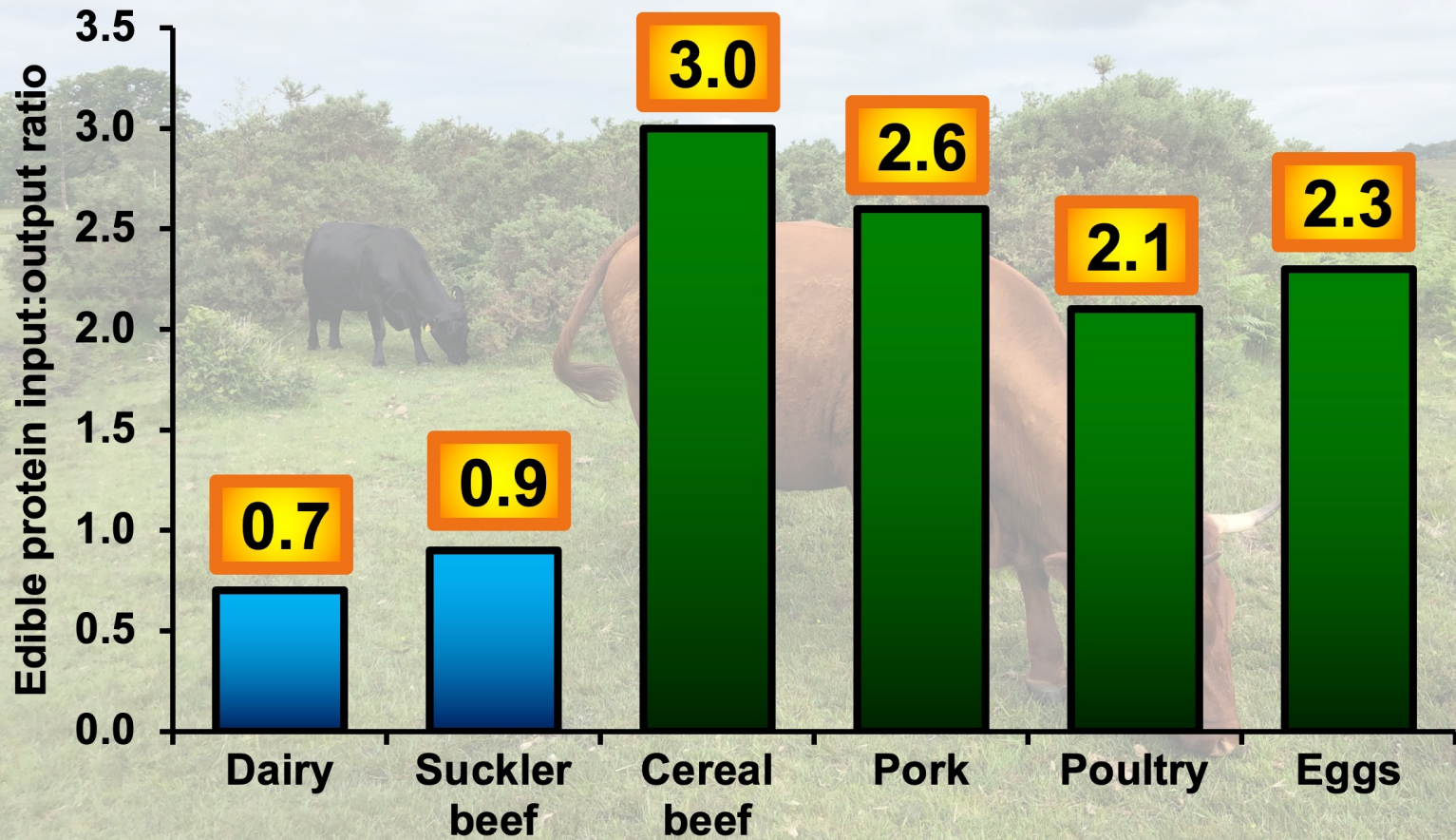


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# Grazing cattle systems produce more human-edible protein than they consume



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

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## Drinks vary in nutrient density and greenhouse gas emissions

	<b>Nutrient density</b>	<b>Carbon footprint g CO<sub>2</sub>/100 g drink</b>
<b>Whole milk</b>	<b>53.8</b>	<b>99</b>
<b>Orange juice</b>	<b>17.2</b>	<b>61</b>
<b>Soya juice</b>	<b>7.6</b>	<b>30</b>
<b>Oat juice</b>	<b>1.5</b>	<b>21</b>
<b>Red wine</b>	<b>1.2</b>	<b>204</b>
<b>Soda</b>	<b>0.0</b>	<b>109</b>
<b>Beer</b>	<b>0.0</b>	<b>101</b>
<b>Water</b>	<b>0.0</b>	<b>10</b>

Source: Created by Dr. Jude L. Capper, 2020. Data from: Smedman et al. (2010). Nutrient density to climate impact (NDCI) index of beverages. Food & Nutr. Res.

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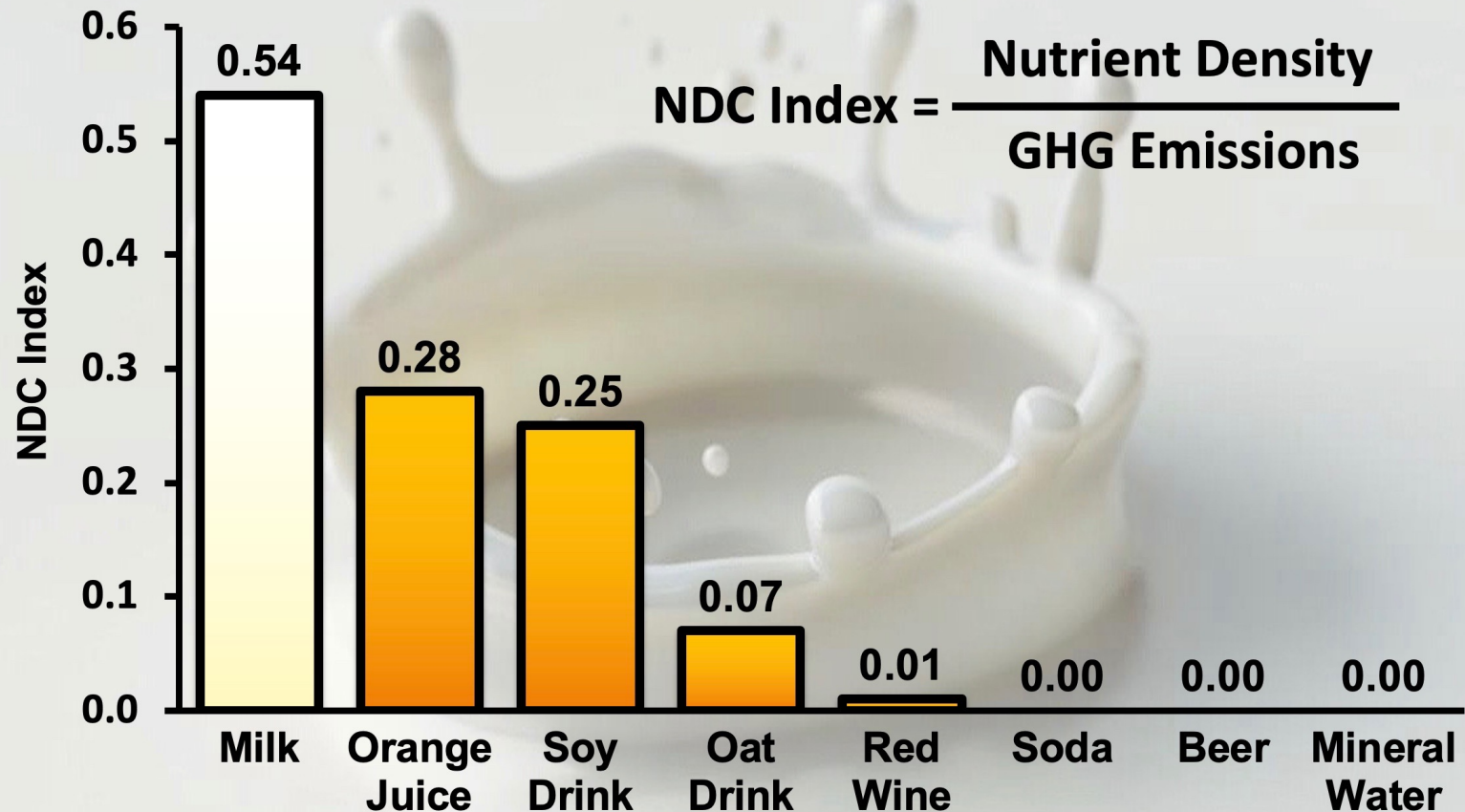


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# Nutrient density should be included when assessing carbon footprint



Source: Created by Dr. Jude L. Capper, 2020. Data from: Smedman et al. (2010). Nutrient density to climate impact (NDCI) index of beverages. Food & Nutr. Res.

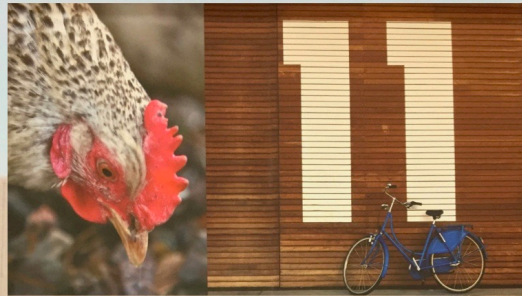
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We need transparency not bucolic imagery

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TRACED FROM FARM TO KITCHEN

Source: Created by and photo 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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# Thank you!

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<http://bovidiva.com/presentationlinks>

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## Questions?



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Source: Created by Dr. Jude L. Capper, 2020. Cartoon from: <http://RubesCartoons.com>