Base conceitual e estratégias de manejo para reduzir emissões de carbono na pecuária de leite

Luiz Gustavo Ribeiro Pereira

Embrapa Gado de Leite

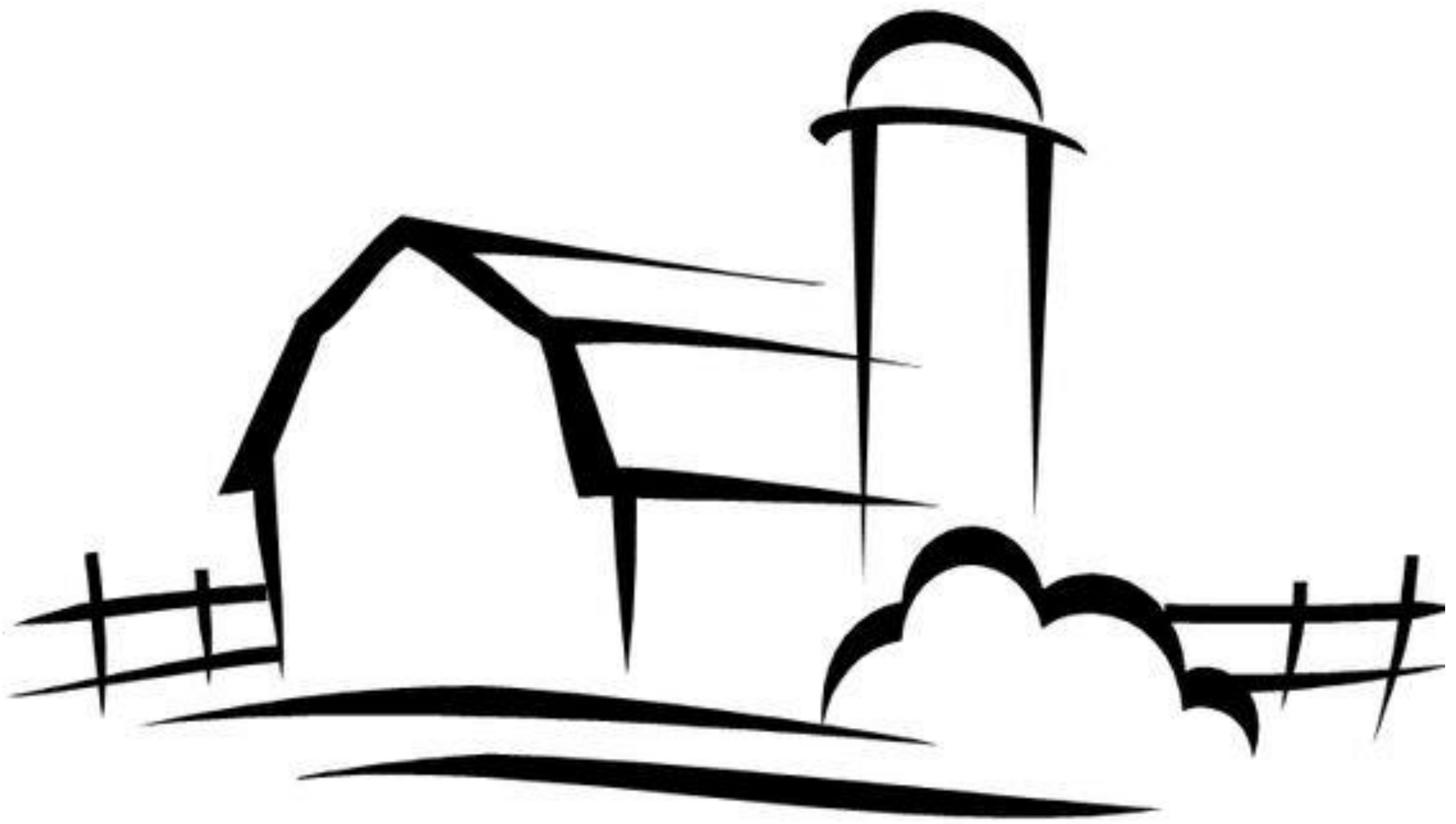
ROTEIRO

Produção de Alimento - Saúde, Bem-Estar Animal e Meio Ambiente

Desinformação na era da informação

Conceitos e caminhos para o leite baixo CARBONO

Considerações Finais



Demanda direcionada pelo consumidor

Vida Saudável

Bem estar animal

Sistemas sustentáveis (Carbono/H_2O)

PRODUTO NEUTRO de CARBONO IBDN.ORG.BR

Carbono NEUTRO 2

carbono neutro

SELO SUSTENTAR NEUTRO CO_2

CO_2 neutral

Embrapa

Embrapa

Target / Grocery / Meat & Seafood / Meatless Alternatives

Beyond Meat Burger - 2pk/4oz Patties

Shop all Beyond Meat

Quantity
1

At a glance

Plant Based

Gluten Free

Non-GMO

Vegan

Highlights

- 20g of plant-based protein (more than beef!)
- Soy Free
- Gluten Free
- NON GMO Verified
- 100% vegan

Embrapa

Animal (2018), 12:8, pp 1722–1734
doi:10.1017/S1751731117002592

animal

Review: Optimizing ruminant conversion of feed protein to human food protein

G. A. Broderick†

Table 2 *Comparison of the protein quality of almond milk and cow's milk using the Digestible Indispensable Amino Acid Score (DIAAS) method (Ertl* et al.*, 2016)*

				FAO standard (6 months to 3 years)[1]			
				Indispensable amino acid (mg/g protein)			
				Lys	SAA[2]	Thr	Trp
				57	27	31	8.5
				Indispensable amino acid (mg)			
Source	Item	Energy (Kcal)	Protein (g)	Lys	SAA	Thr	Trp
Almond milk (sweetened)	Per serving (240 g)	91	1.0	26.8	17.5	28.3	10.0
	mg/g protein			26.8	17.5	28.3	10.0
	True digestiblity[3]			0.88	0.88	0.88	0.88
	DIAA[4] (mg/g protein)			23.6	15.4	24.9	8.8
	DIAAS of almond milk			0.41	0.57	0.80	1.04
Cow's milk (1% fat)	Per serving (244 g)	102	8.2	688	264	349	105
	mg/g protein			83.7	32.1	42.5	12.8
	True digestibility			0.95	0.94	0.90	0.90
	DIAA (mg/g protein)			79.5	30.2	38.2	11.5
	DIAAS of cow's milk			1.39	1.12	1.23	1.35
Relative value	1% Cow's milk/almond milk			270%			

FAO = Food and Agriculture Organization of the United Nations.
[1]Standard pattern of require indispensable amino acids, expressed in mg amino acid/g protein consumed, for lysine (Lys), S-amino acids (SAA), threonine (Thr) and tryptophan (Trp) (FAO, 2013a).
[2]SAA = methionine plus cystine.
[3]True digestibility of almond protein, mean of three cultivars from Ahrens *et al.* (2005).
[4]Digestible indispensable amino acids (DIAA) (true digestibility × amino acid concentration in protein).

BlackRock Funds Investment strategies Insights & education About us

Embrapa

Matters of money tug at both our intellect and emotions. Hear from two pros on how to find balance.

Larry Fink's 2021 letter to CEOs

Sincerely,

Larry Fink
Chairman and Chief Executive Officer

› **Read more**

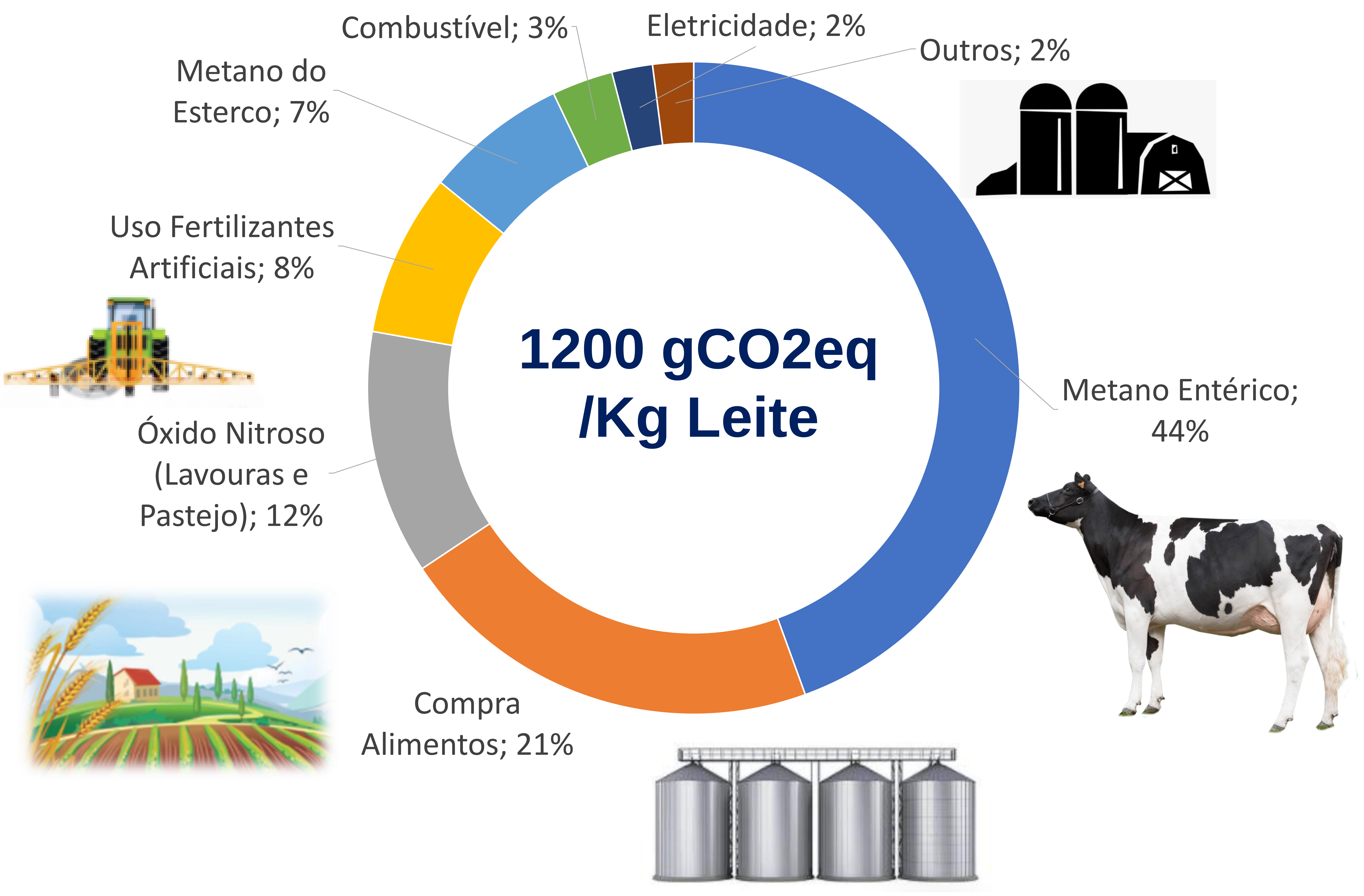
From January through November 2020, investors in mutual funds and ETFs invested $288 billion globally in sustainable assets, a 96% increase over the whole of 2019.[1] I believe that this is the beginning of a **long but rapidly accelerating transition** – one that will unfold over many years and reshape asset prices of every type. **We know that climate risk is investment risk. But we also believe the climate transition presents a historic investment opportunity.**

Delivering the European Green Deal

Making Europe the first climate neutral continent in the world is our goal.

These proposals aim to make all sectors of the EU's economy fit to meet this challenge. They set the EU on a path to reach its climate targets by 2030 in a fair, cost effective and competitive way.

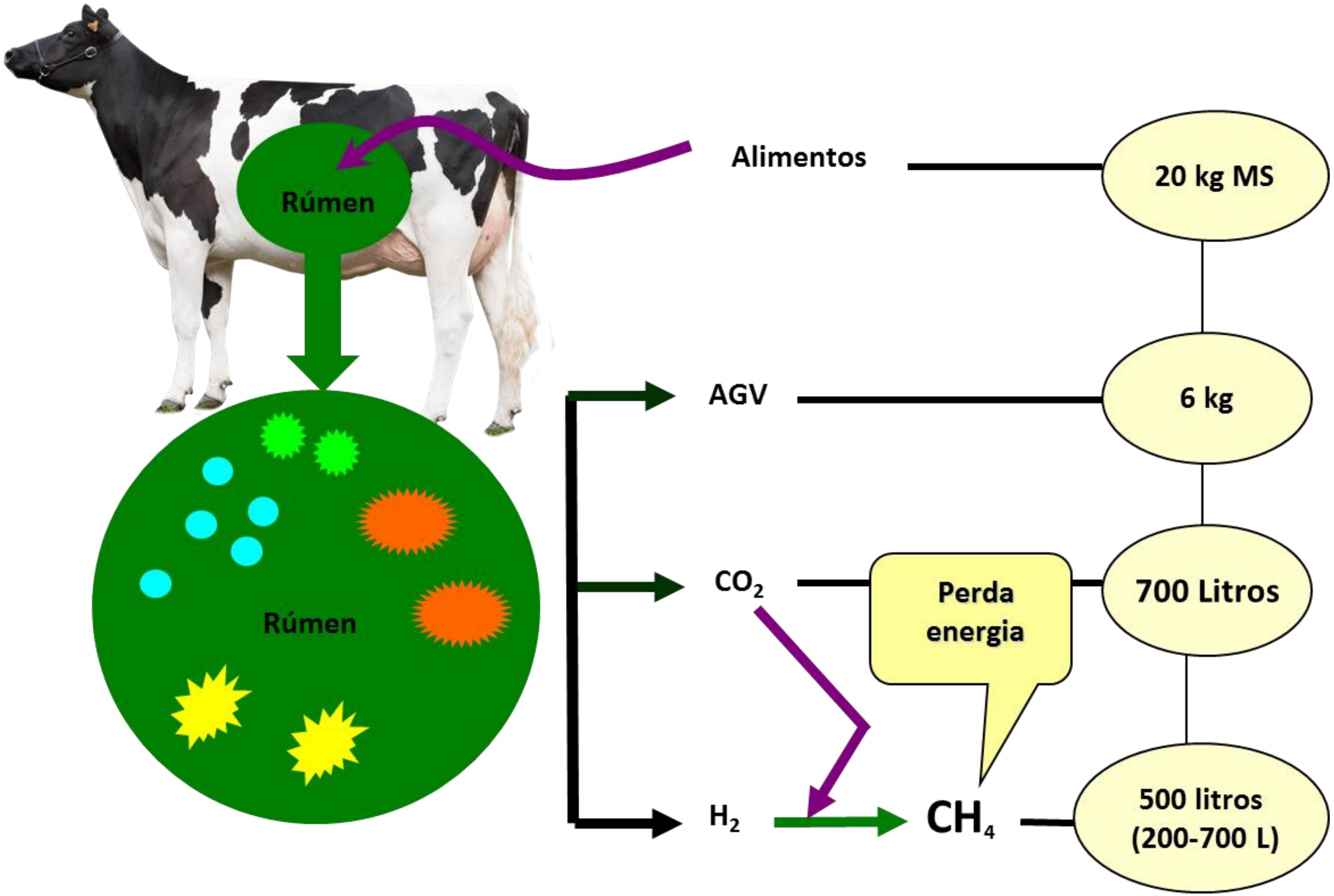
Leite Carbono Neutro



Entendendo a Pegada de Carbono do Leite

Embrapa

Leite Carbono Neutro



Transformando Capim em Leite

Alimento de elevada densidade nutricional

GEE na Pecuária: Quebrando paradigmas!

Metano entérico representa de **5-6% das emissões** antropogênicas de GEE

Ruminantes **competem menos por alimentação humana** – Espécies estratégicas para produzir alimento para o Mundo

Leite e Carne de Bovinos – Alimentos de **elevada densidade nutricional**

CH_4 – Acúmulo x Fluxo de gases de efeito estufa/Serviços Ambientais

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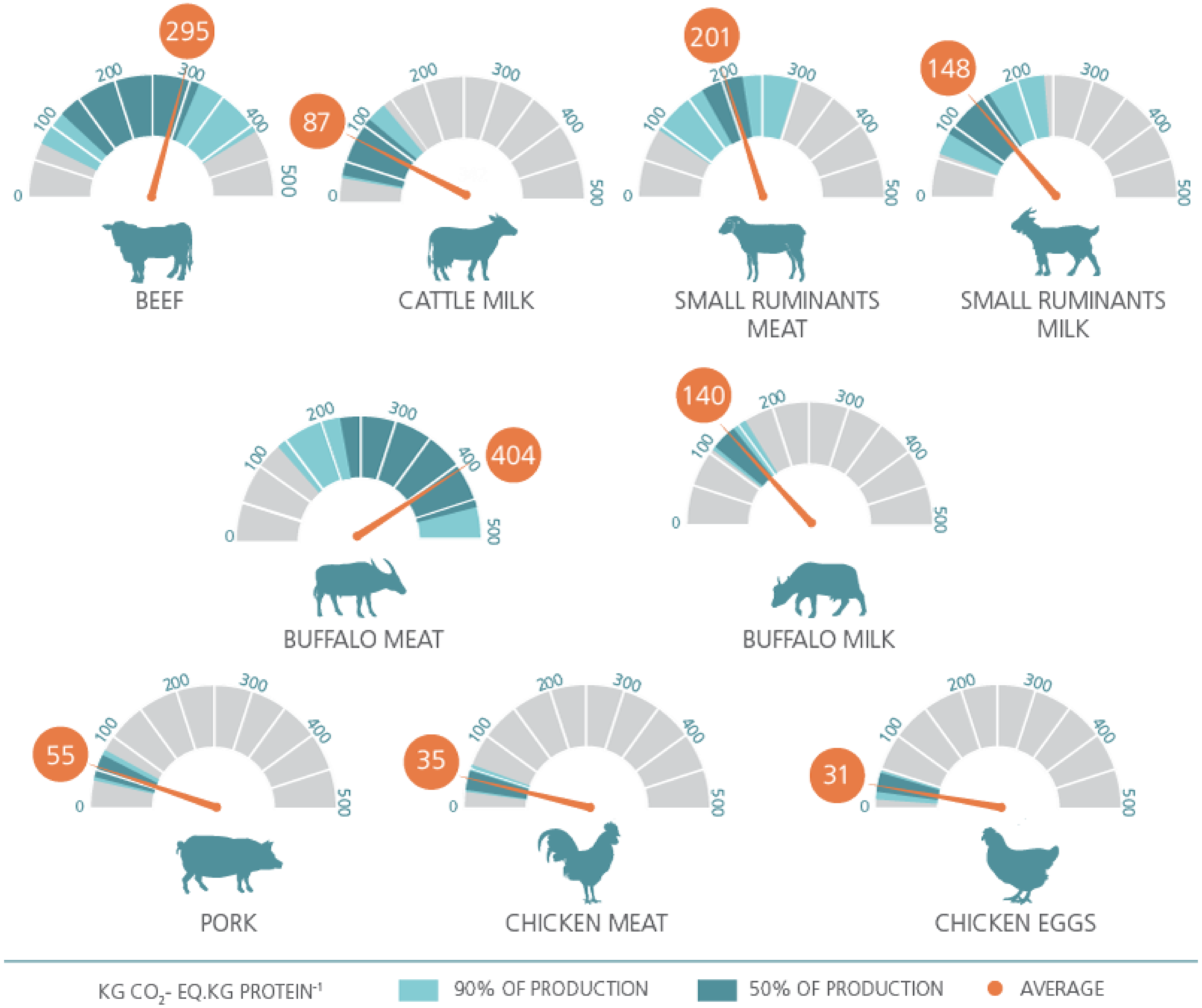

Food and Agriculture Organization of the United Nations

Global Livestock Environmental Assessment Model (GLEAM)

GLEAM 2.0 - Assessment of greenhouse gas emissions and mitigation potential

Embrapa

Table 1 *Animal systems: gross efficiencies of converting energy and protein into product and returns of human-edible inputs in product*[1]

Country	System	Energy		Protein	
		Gross efficiency	Human-edible return	Gross efficiency	Human-edible return
Argentina[2]	Poultry (eggs)	0.17	0.26	0.23	0.45
	Poultry (meat)	0.18	0.28	0.30	0.69
	Pork	0.15	0.24	0.07	0.11
	Beef	0.02	3.19	0.02	6.12
	Milk (cow)	0.19	4.61	0.16	1.64
United States[2]	Poultry (eggs)	0.17	0.24	0.24	0.36
	Poultry (meat)	0.19	0.28	0.31	0.62
	Pork	0.21	0.31	0.19	0.29
	Beef	0.07	0.65	0.08	1.19
	Milk (cow)	0.25	1.07	0.21	2.08
United Kingdom[3]	Poultry (eggs)	0.20	0.28	0.31	0.43
	Poultry (meat)	0.22	0.30	0.33	0.48
	Pork	0.11	0.16	0.23	0.38
	Beef (mean)	0.05	0.24	0.08	0.49
	Milk (cow)	0.22	2.13	0.18	1.41

[1]Gross efficiencies estimated as outputs of human-edible energy and protein divided by total energy and protein inputs. Human-edible returns calculated as human-edible outputs divided by human-edible inputs.
[2]Data summarized from CAST (1999).
[3]Data summarized from Wilkinson (2011). Values for 'Beef' are means of three production systems.

Animal (2018), 12:8, pp 1722–1734 © The Animal Consortium 2017
doi:10.1017/S1751731117002592

animal

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Embrapa

food & nutrition research

ORIGINAL ARTICLE

Greenhouse gas emissions of realistic dietary choices in Denmark: the carbon footprint and nutritional value of dairy products

Louise Bruun Werner[1]*, Anna Flysjö[2] and Tine Tholstrup[1]

[1]Department of Nutrition, Exercise and Sports, Faculty of Sciences, University of Copenhagen, Copenhagen, Denmark; [2]Arla Foods, Viby J, Denmark

Table 7. Nutrient density in relation to climate impact for solid food items

Solid food items	Number of nutrients ≥15% NNR	% of NNR in 100 g food	Nutrient density	GHGE	NDCI Index
Beef	9	389	166.8	2799	0.06
Rice, polished	3	175	25.0	374	0.07
Bananas	2	115	10.9	122	0.09
Chicken	7	297	98.8	521	0.19
Potatoes	2	138	13.2	57	0.23
Pasta	5	187	44.5	193	0.23
Rice, brown	6	326	93.1	374	0.25
Cheese	11	545	285.5	923	0.31
Pork	10	387	184.4	557	0.33
Fish, Cod	7	465	155.0	447	0.35
Broccoli	4	351	66.8	167	0.40
Carrot	1	187	8.9	22	0.40
Eggs	11	440	230.2	210	1.10
Oatmeal	8	352	134.1	90	1.49
Beans, brown	12	471	269.4	124	2.17

NNR: Nordic Nutrition Recommendations; NDCI index: nutrient density to climate impact index (NDCI = nutrient density/ GHGE); nutrient density = percentage of NNR in 100 g of product × number of nutrients ≥15% NNR/ 21; GHGE: greenhouse gas emission (gram CO_2e per 100 g food items) excluded waste at consumer level.

Embrapa

frontiers in Sustainable Food Systems

REVIEW
published: 06 October 2020
doi: 10.3389/fsufs.2020.00128

Plant-Based Meats, Human Health, and Climate Change

Stephan van Vliet[1]*, *Scott L. Kronberg*[2] and *Frederick D. Provenza*[3]

[1] Duke Molecular Physiology Institute, Duke University Medical Center, Durham, NC, United States, [2] Northern Great Plains Research Laboratory, USDA-Agricultural Research Service, Mandan, ND, United States, [3] Department of Wildland Resources, Utah State University, Logan, UT, United States

Ground Beef

Nutrition Facts

Serving size	(113g)
Amount Per Serving	
Calories	220
	% Daily Value*
Total Fat 14g	18%
Saturated Fat 5g	25%
Trans Fat 0g	
Cholesterol 60mg	20%
Sodium 70mg	3%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 23g	46%
Vitamin D 0.1mcg	0%
Calcium 12mg	0%
Iron 2mg	10%
Potassium 289mg	6%
Thiamin 0.05mg	4%
Riboflavin 0.2mg	15%
Niacin 4.8mg	30%
Vitamin B6 0.4mg	25%
Folate 6mcg	2%
Vitamin B12 2mcg	80%
Phosphorus 175mg	15%
Zinc 4.6mg	40%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Soy-Based Alternative

Nutrition Facts

Serving size	(113g)
Amount Per Serving	
Calories	250
	% Daily Value*
Total Fat 14g	18%
Saturated Fat 8g	40%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 370mg	16%
Total Carbohydrate 9g	3%
Dietary Fiber 3g	11%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 19g	38%
Vitamin D 0mcg	0%
Calcium 180mg	15%
Iron 4.2mg	25%
Potassium 610mg	15%
Thiamin 28.2mg	2350%
Riboflavin 0.4mg	30%
Niacin 4.8mg	30%
Vitamin B6 0.4mg	25%
Folate 115mcg	30%
Vitamin B12 3mcg	120%
Phosphorus 180mg	15%
Zinc 5.5mg	50%

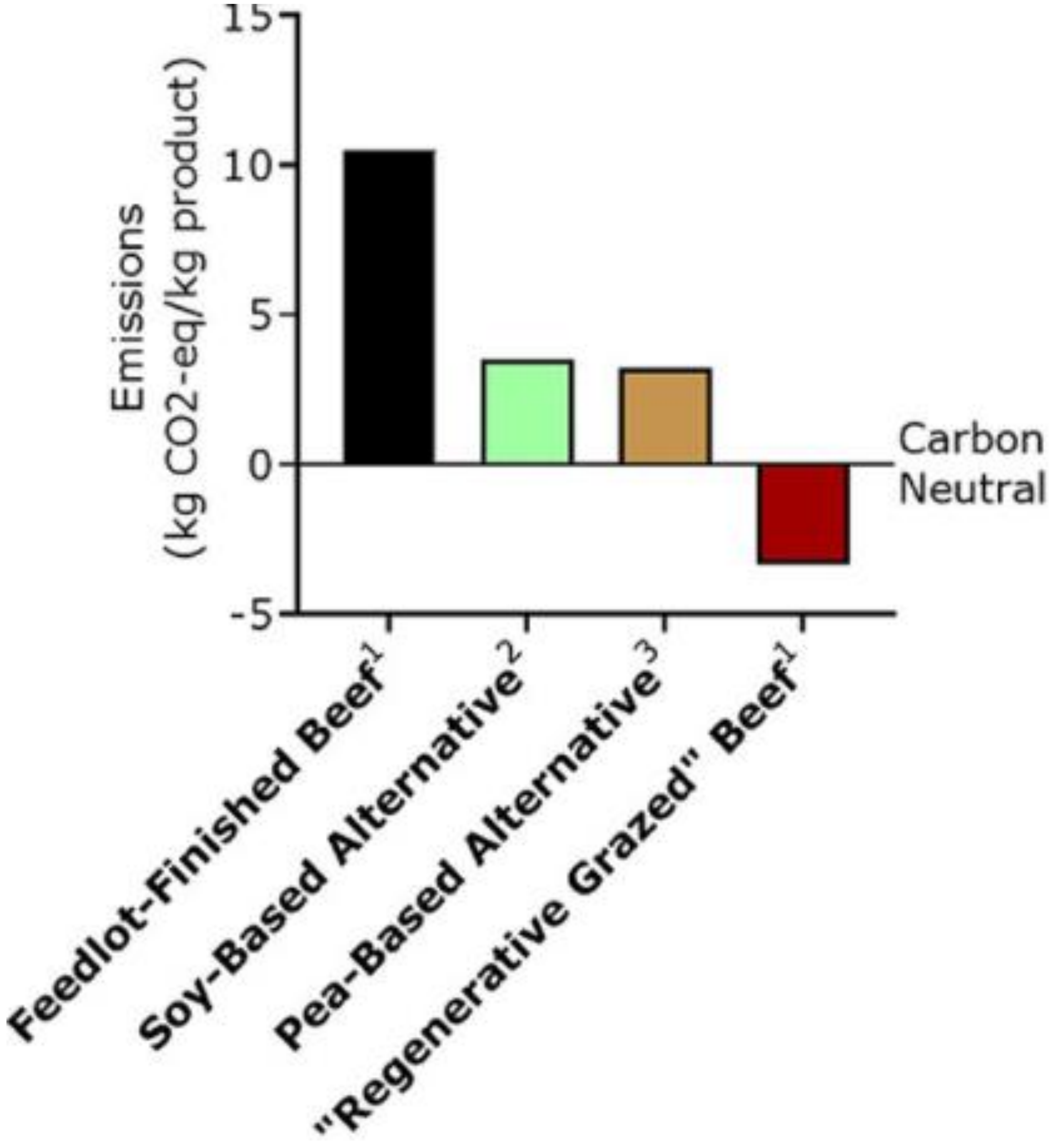
*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Pea-Based Alternative

Nutrition Facts

Serving size	(113g)
Amount Per Serving	
Calories	260
	% Daily Value*
Total Fat 18g	23%
Saturated Fat 5g	25%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 350mg	15%
Total Carbohydrate 5g	2%
Dietary Fiber 2g	7%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 20g	40%
Vitamin D 0mcg	0%
Calcium 100mg	8%
Iron 4mg	20%
Potassium 280mg	6%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.



Embrapa

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Embrapa

npj | Climate and Atmospheric Science www.nature.com/npjclimatsci

ARTICLE OPEN

A solution to the misrepresentations of CO_2-equivalent emissions of short-lived climate pollutants under ambitious mitigation

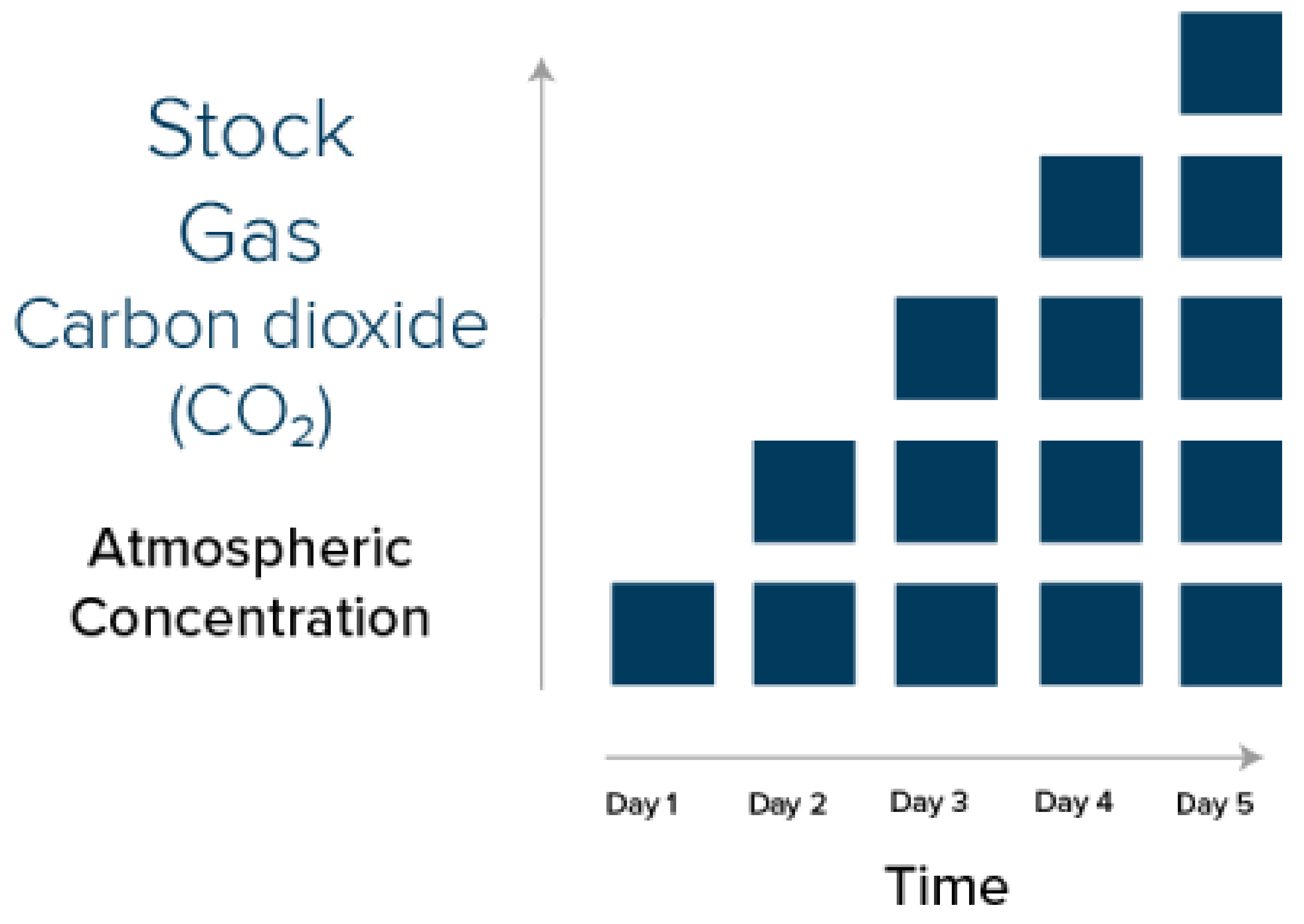
Myles R. Allen[1,2], Keith P. Shine[3], Jan S. Fuglestvedt[4], Richard J. Millar[1], Michelle Cain[1,5], David J. Frame[6] and Adrian H. Macey[7]

While cumulative carbon dioxide (CO_2) emissions dominate anthropogenic warming over centuries, temperatures over the coming decades are also strongly affected by short-lived climate pollutants (SLCPs), complicating the estimation of cumulative emission budgets for ambitious mitigation goals. Using conventional Global Warming Potentials (GWPs) to convert SLCPs to "CO_2-equivalent" emissions misrepresents their impact on global temperature. Here we show that peak warming under a range of mitigation scenarios is determined by a linear combination of cumulative CO_2 emissions to the time of peak warming and non-CO_2 radiative forcing immediately prior to that time. This may be understood by expressing aggregate non-CO_2 forcing as cumulative CO_2 forcing-equivalent (CO_2-fe) emissions. We show further that contributions to CO_2-fe emissions are well approximated by a new usage of GWP, denoted GWP*, which relates cumulative CO_2 emissions to date with the current rate of emission of SLCPs. GWP* accurately indicates the impact of emissions of both long-lived and short-lived pollutants on radiative forcing and temperatures over a wide range of timescales, including under ambitious mitigation when conventional GWPs fail. Measured by GWP*, implementing the Paris Agreement would reduce the expected rate of warming in 2030 by 28% relative to a No Policy scenario. Expressing mitigation efforts in terms of their impact on future cumulative emissions aggregated using GWP* would relate them directly to contributions to future warming, better informing both burden-sharing discussions and long-term policies and measures in pursuit of ambitious global temperature goals.

npj Climate and Atmospheric Science (2018)1:16 ; doi:10.1038/s41612-018-0026-8

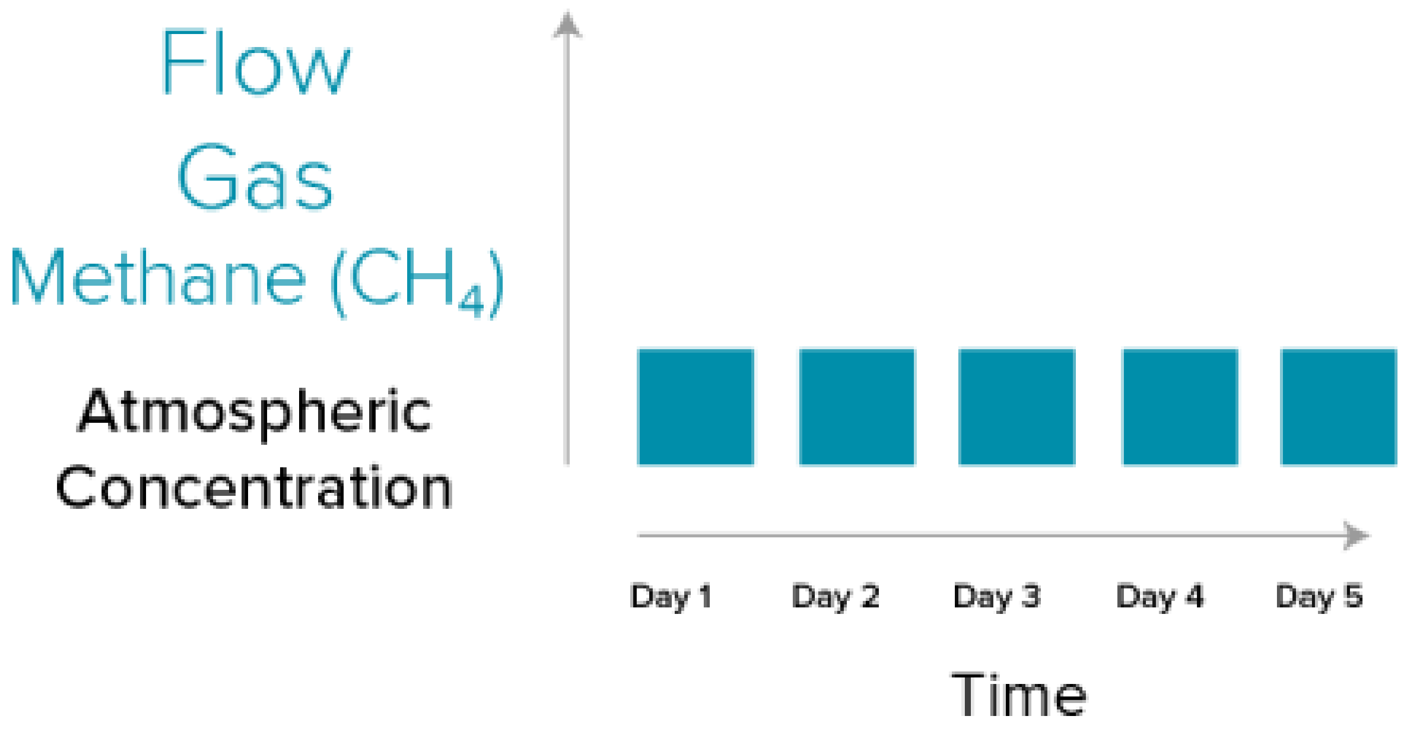
Embrapa

■ = Pulse of CO_2



Stock gases will accumulate over time, because they stay in the environment.

■ = Pulse of CH_4



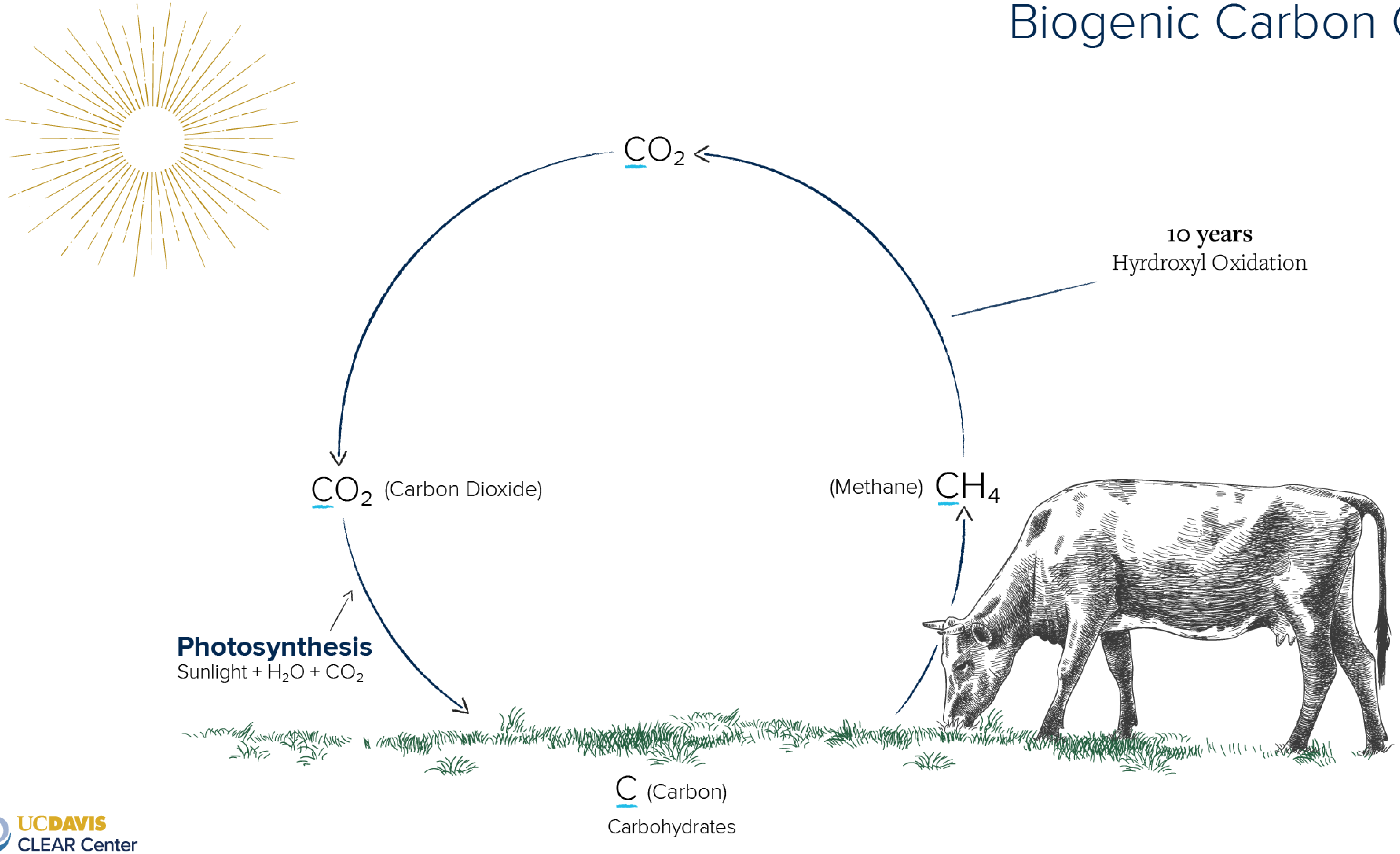
Flow gases will stay stagnent, as they are destroyed at the same rate of emission.

UCDAVIS CLEAR Center

Based on research by Myles R. Allen, Keith P. Shine, Jan S. Fuglestvedt, Richard J. Millar, Michelle Cain, David J. Frame & Adrian H. Macey.
Read more here: https://rdcu.be/b1t7S

Embrapa

Biogenic Carbon Cycle



Liu *et al. CABI Agric Biosci* (2021) 2:22
https://doi.org/10.1186/s43170-021-00041-y

CABI Agriculture and Bioscience

RESEARCH

Open Access

Rethinking methane from animal agriculture

Shule Liu, Joe Proudman and Frank M. Mitloehner*

Abstract

Background: As the global community actively works to keep temperatures from rising beyond 1.5 °C, predicting greenhouse gases (GHGs) by how they warm the planet—and not their carbon dioxide (CO_2) equivalence—provides information critical to developing short- and long-term climate solutions. Livestock, and in particular cattle, have been broadly branded as major emitters of methane (CH_4) and significant drivers of climate change. Livestock production has been growing to meet the global food demand, however, increasing demand for production does not necessarily result in the proportional increase of CH_4 production. The present paper intends to evaluate the actual effects of the CH_4 emission from U.S. dairy and beef production on temperature and initiate a rethinking of CH_4 associated with animal agriculture to clarify long-standing misunderstandings and uncover the potential role of animal agriculture in fighting climate change.

Methods: Two climate metrics, the standard 100-year Global Warming Potential (GWP_{100}) and the recently proposed Global Warming Potential Star (GWP*), were applied to the CH_4 emission from the U.S. cattle industry to assess and compare its climate contribution.

Results: Using GWP*, the projected climate impacts show that CH_4 emissions from the U.S. cattle industry have not contributed additional warming since 1986. Calculations show that the California dairy industry will approach climate neutrality in the next ten years if CH_4 emissions can be reduced by 1% per year, with the possibility to induce cooling if there are further reductions of emissions.

Conclusions: GWP* should be used in combination with GWP to provide feasible strategies on fighting climate change induced by short-lived climate pollutants (SLCPs). By continuously improving production efficiency and management practices, animal agriculture can be a short-term solution to fight climate warming that the global community can leverage while developing long-term solutions for fossil fuel carbon emissions.

Keywords: Methane, Short-lived climate pollutant, Greenhouse gas, Livestock, Cattle, Global warming potential, GWP*

Leite Carbono Neutro

Gases de Efeito Estufa e Pecuária – Prioridade Estratégica na Embrapa

Agrogases (2004-2008) Rede Agrogases

PECUS (2010-2018) PECUS

RumenGases (2010-2019) RumenGases

Leite Carbono Neutro

Gases de Efeito Estufa e Pecuária – Prioridade Estratégica na Embrapa

Investimentos público em infraestrutura de pesquisa



Embrapa

Gases de Efeito Estufa e Pecuária – Prioridade Estratégica na Embrapa

Resultados:

Investimento público permitiu a geração dos **fatores de emissão** que serão usados nos **protocolos** de avaliação de **pegada de carbono**

Animal (2020), **14:S3**, pp s438–s452 © The Author(s), 2020. Published by Cambridge University Press on behalf of The Animal Consortium
doi:10.1017/S1751731120001743

animal

Predicting enteric methane production from cattle in the tropics

R. S. Ribeiro[1]*, J. P. P. Rodrigues[2]*, R. M. Maurício[1], A. L. C. C. Borges[3], R. Reis e Silva[3], T. T. Berchielli[4], S. C. Valadares Filho[5], F. S. Machado[6], M. M. Campos[6], A. L. Ferreira[6], R. Guimarães Júnior[7], J. A. G. Azevêdo[8], R. D. Santos[9], T. R. Tomich[6] and L. G. R. Pereira[6†a]

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(Received 16 December 2019; Accepted 7 July 2020; First published online 11 August 2020)

Table 3 *Newly developed prediction equations for methane production (MJ/day) by dataset using various prediction variables and without including gross energy digestibility (GEd) for cattle raised in tropical conditions*

		Model performance						
Ref.[1]	Estimated equation	CCC	C_b	r_c	$RMSPE_{\%}$	$ECT_{\%}$	$ER_{\%}$	RSR
General (GEN, $n=153$)								
67	$0.734(1.005) + 0.041(0.005) \times GEI + 0.009(0.002) \times BW - 0.040(0.011) \times EE$	0.872	0.991	0.879	22.4	0.00	0.12	0.47
51	$2.048(0.436) + 0.052(0.002) \times GEI - 0.038(0.01) \times EE$	0.867	0.984	0.882	22.3	0.04	0.20	0.47
49	$1.067(0.332) + 0.051(0.003) \times GEI$	0.860	0.984	0.875	22.9	0.00	0.51	0.48
19	$0.494(0.694) + 0.775(0.072) \times DMI + 0.008(0.002) \times BW - 0.037(0.011) \times EE$	0.840	0.985	0.853	24.6	0.00	0.17	0.52
3	$1.947(0.469) + 0.934(0.052) \times DMI - 0.032(0.011) \times EE$	0.829	0.975	0.850	24.9	0.05	0.23	0.53
17	$-0.3(0.6) + 0.753(0.068) \times DMI + 0.007(0.002) \times BW$	0.828	0.984	0.842	25.5	0.03	0.24	0.54
1	$1.101(0.275) + 0.906(0.046) \times DMI$	0.823	0.974	0.845	25.3	0.01	0.51	0.53
Lactating dairy cows (LAC, $n=43$)								
1	$4.15(1.53) + 0.822(0.136) \times DMI$	0.717	0.969	0.740	14.8	0.03	0.09	0.67
49	$3.35(1.52) + 0.047(0.007) \times GEI$	0.688	0.969	0.710	15.5	0.01	0.63	0.70
Growing beef and dairy cattle and non-lactating dairy cows (GCNL, $n=88$)								
51	$1.597(0.603) + 0.0563(0.005) \times GEI - 0.04(0.013) \times EE$	0.531	0.948	0.559	28.1	0.23	6.64	0.85
65	$0.983(0.572) + 0.0368(0.0038) \times GEI + 0.0098(0.0019) \times BW$	0.502	0.992	0.506	30.4	0.01	13.91	0.92
49	$1.002(0.335) + 0.0497(0.0036) \times GEI$	0.497	0.958	0.518	29.2	0.03	8.04	0.89
19	$0.97(0.76) + 0.813(0.104) \times DMI + 0.0054(0.0025) \times BW - 0.0403(0.0103) \times EE$	0.490	0.978	0.501	30.3	0.01	12.83	0.92
3	$1.943(0.631) + 0.943(0.09) \times DMI - 0.037(0.01) \times EE$	0.467	0.965	0.484	30.8	0.13	13.53	0.94
1	$1.006(0.577) + 0.9072(0.091) \times DMI$	0.446	0.974	0.458	31.5	0.03	14.90	0.96

GEI = gross energy intake (MJ/day); BW = body weight (kg); EE = ether extract (g/kg of DM); DMI = DM intake (kg/day); CCC = concordance correlation coefficient; C_b = bias correction factor; r_c = correlation coefficient; $RMSPE_{\%}$ = root mean square prediction error as percentage of mean observed values; $ECT_{\%}$ = error due to overall bias of prediction as percentage of mean square prediction error; $ER_{\%}$ = error due to deviation of the regression slope from unity as percentage of mean square prediction error; RSR = RMSPE to SD ratio.
*Plots of residuals *v.* centered predicted are in Figure 3.
[1]Reference for dataset and model number described in Supplementary Table S3.

Embrapa

Gases de Efeito Estufa e Pecuária – Prioridade Estratégica na Embrapa

Resultados:

Science of the Total Environment 571 (2016) 744–754

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Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Greenhouse gases inventory and carbon balance of two dairy systems obtained from two methane-estimation methods

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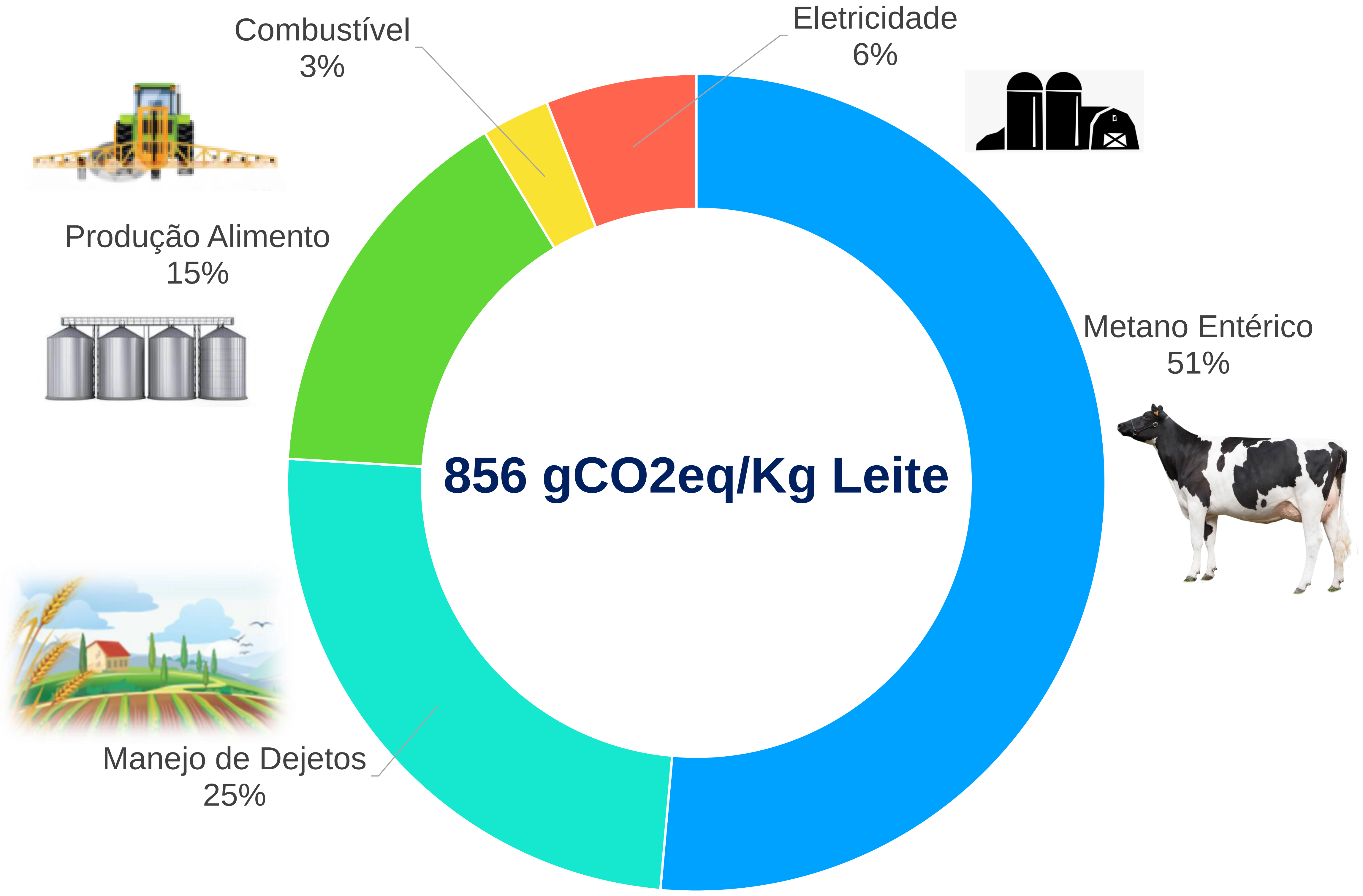
	Confinado	Semi-confinado
Número de animais	113	12
Área de pasto (ha)	38,50	1,00
Total área (ha)	202	16
Produção de leite porr ano (L/ano)	420.143	37.011

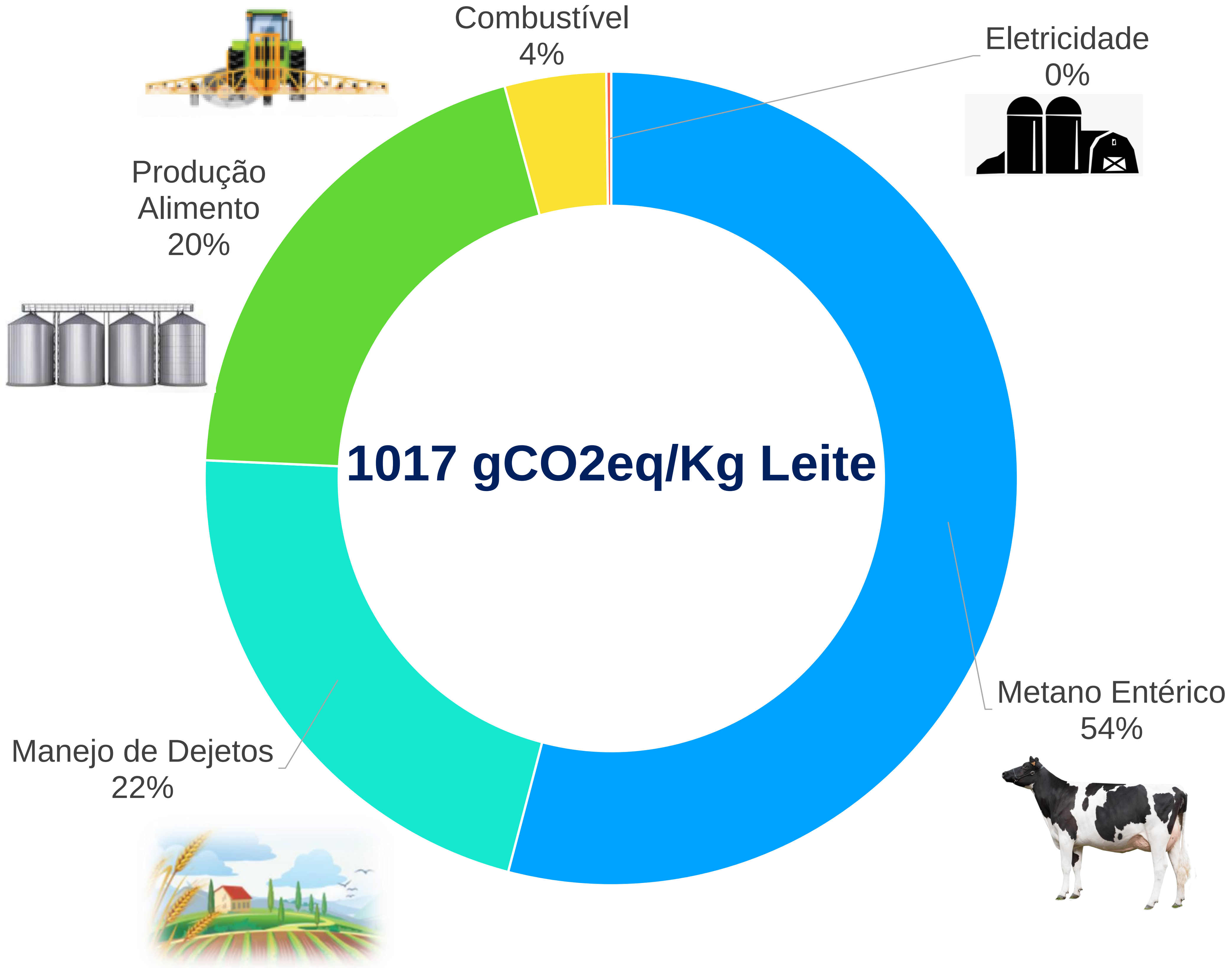
Embrapa

Leite Baixo Carbono

FAZENDA 1 - CONFINAMENTO



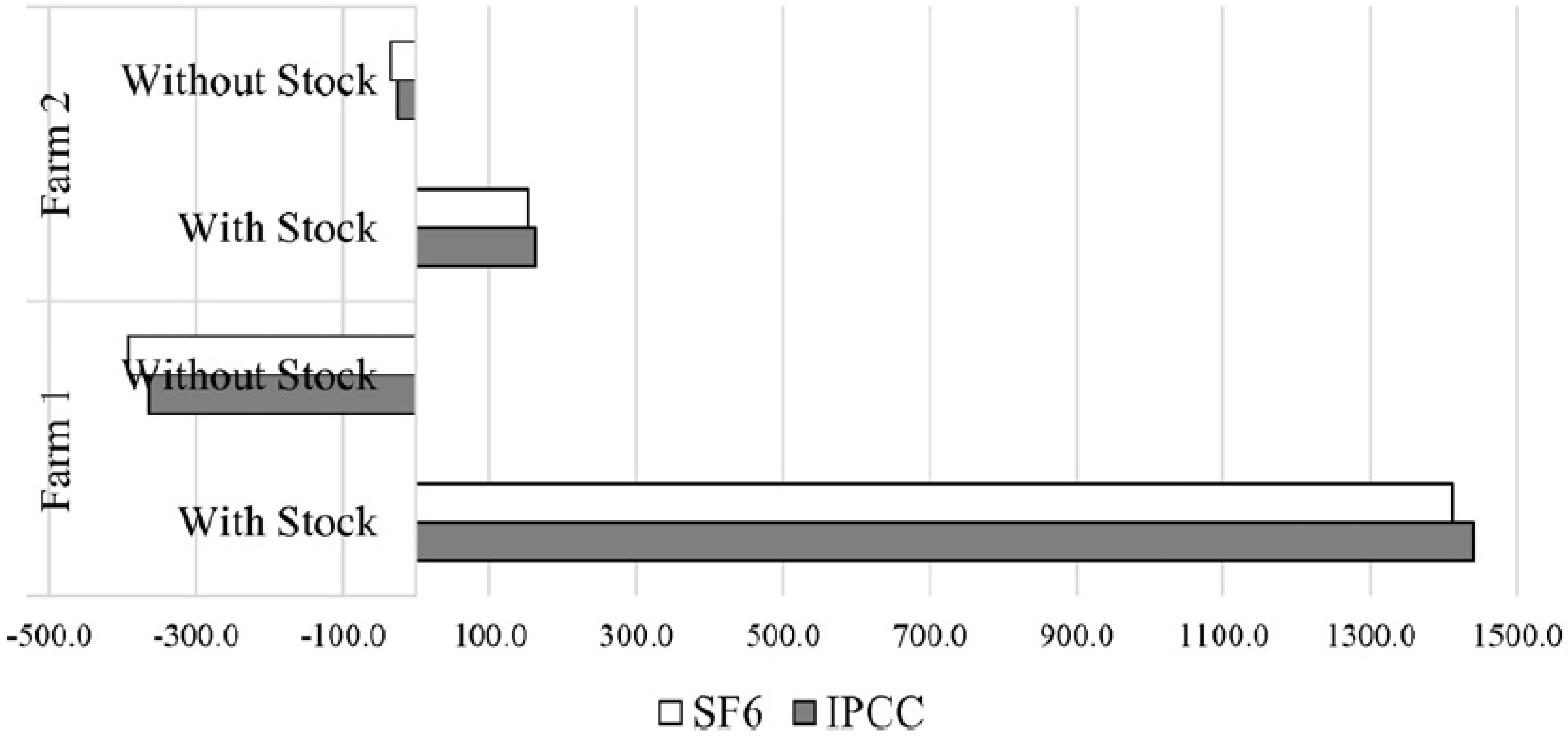
FAZENDA 2 - SEMI-CONFINAMENTO



Embrapa

Leite Baixo Carbono

	Confinado	Semi-confinado
Sem C Solo IPCC	-363,5	-25,1
Sem C Solo SF6	-392,1	-33,9
Com Carbono Solo IPCC	1441,7	162,8
Com Carbono Solo SF6	1413,1	154,0



OPORTUNIDADE: Pecuária como prestadora de serviços ambientais!!!

Embrapa

Leite Carbono Neutro

Gases de Efeito Estufa e Pecuária – Prioridade Estratégica na Embrapa

Agrogases (2004-2008)

PECUS (2010-2018)

RumenGases (2010-2019)

Direcionadores para a transição verde ou descarbonização da pecuária leiteira

Compromisso assumido pelo setor privado

2019 – Atual e Futuro: Ação estratégica via iniciativas Público-Privado

Embrapa

ROTEIRO DE EMISSÕES LÍQUIDAS ZERO DA NESTLÉ

Nosso caminho para a regeneração para as gerações futuras

Resolver o problema significa identificar o problema. Descobrimos que a Nestlé emitiu 92 milhões de toneladas de gases de efeito estufa em 2018*. Agora que conhecemos esse dado, sabemos o caminho a seguir.

*As emissões totais de GEE foram de 113 milhões de toneladas (CO_2 equivalente) em 2018, 92 das quais estão no escopo de nosso compromisso de 1,5° C com a ONU.

As empresas e suas emissões crescem com o tempo. É por isso que estamos nos comprometendo com zero emissões líquidas com base em nossa referência de 2018, não importa o quanto nossa empresa cresça.

— Caminho para emissões zero até 2050

- - Negócios habituais

Emissões por operação
(milhões de toneladas de CO_2e, 2018)

65.6	Aquisição de nossos ingredientes
7.0	Fabricação de nossos produtos
11.0	Embalagem de nossos produtos
7.5	Gestão logística
0.8	Viagens e deslocamentos de funcionários

Evoluindo mais rápido

Queremos fazer tudo da forma mais correta desde o início. Estamos acelerando nosso trabalho na fabricação, embalagem e marcas neutras em carbono. Estamos também investindo 1,2 bilhão de francos suíços para ajudar a estimular a agricultura regenerativa em nossa cadeia de fornecimento, como parte de um investimento total de 3,2 bilhões de francos suíços até 2025.

Nossos marcos

- 100% da cadeia de fornecimento primária livre de desmatamento até 2022
- Mudar nossa frota global de veículos para opções com emissões mais baixas até 2025
- 100% do óleo de palma com certificação de sustentabilidade até 2023
- 100% de eletricidade renovável em todas as nossas instalações até 2025
- 100% de nossas embalagens recicláveis ou reutilizáveis até 2025
- 100% cacau e café com certificação de sustentabilidade até 2025
- Fazer com que 20% de nossos ingredientes prioritários tenham uma pegada ambiental menor até 2025
- Cortar 1/3 do plástico virgem em nossas embalagens até 2025
- Plantar 20 milhões de árvores por ano
- A Nestlé Waters se tornará neutra em carbono em 2025

Até 2025, vamos reduzir nossas emissões em **20%**

Escalando

Ao longo do caminho mais verde, investiremos em novas tecnologias e mudanças fundamentais em nossos produtos e negócios em todo o mundo.

- Usar mais energia térmica renovável em nossa fabricação
- Fazer com que 50% de nossos ingredientes prioritários tenham uma pegada ambiental menor até 2030
- 200 milhões de árvores plantadas até 2030

Até 2030, vamos reduzir nossas emissões em **50%**

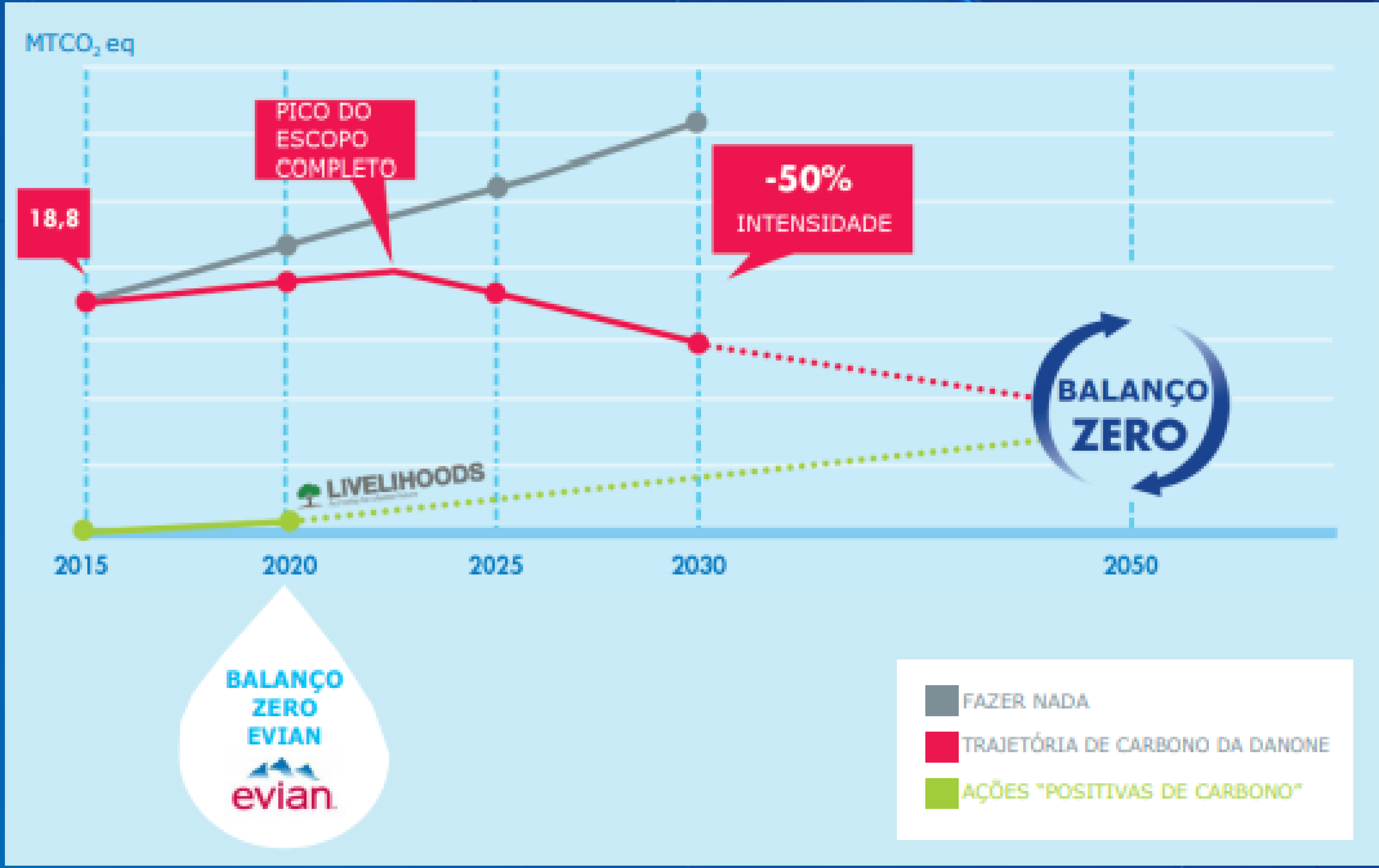
Cumprindo com a nossa promessa

Técnicas agrícolas avançadas fornecerão um sistema alimentar regenerativo em escala, apoiado por logística de emissão zero e operações da empresa. Equilibraremos quaisquer emissões remanescentes por meio de soluções climáticas naturais de alta qualidade que beneficiem as pessoas e o planeta.

Em 2050, chegaremos a emissões **líquidas zero**

2018 | 2021 | 2025 | 2030 | 2050

Embrapa
48 anos



Reducing *our carbon footprint* right from the farm gate

GROUPE LACTALIS

From on-farm milk production to logistics, we identify the sources of greenhouse gas (GHG) emissions coupled with the resources required to reduce our carbon footprint throughout our value chain.

Milk production

Milk production is a major source of greenhouse gas (GHG) emissions. It can also accelerate carbon sequestration as a result of soil amelioration and preservation. In this regard, we encourage our partnering farmers through support, training and innovation to develop an approach of farm management which has a greater positive impact on in climate and environmental challenges.

Reducing emissions through animal feeding

Enteric methane, which is produced from ruminant digestion, is one of the biggest on-farm greenhouse gas emitters. The Eco-Sens monitoring tool, created by Valorex, has developed an innovative solution. The latter reviews the fatty acid profile of a milk sample. In this context, we assess the volume of methane produced during animal digestion, causing a loss in energy intake.

Our reporting ensures more balanced nutrition, which is supplemented by flax seeds. It also helps to reduce cows' GHG emissions by approximately 12%. To date, over 200 Lactalis farmers use the tool in France, Sweden and the Czech Republic.

Our farming footprint

Lactalis joined forces with Cool Farm Alliance (CFA), an ecosystem of organizations (companies, NGOs, universities) developing a common tool—the "Cool Farm Tool"—which measures farms' carbon footprint. The Group plans to deploy this tool as a standard for carbon diagnostics in 11 pilot countries, which account for 76% of raw milk purchases. We also joined the CFA's Dairy & Beef working group in an effort to further develop the tool.

60 to 80%

OF ENERGY SAVED thanks to next-generation milk tanks from the SERAP consortium, joined by Lactalis.

2,000

TONS OF CO_2 saved per year at the solar facility

Industrial process

Environmental performance is fully recognized in our plants' targets.

Our efforts cover the entire production chain, with a focus on reducing carbon footprint as a result of energy transition projects.

Verdun transitions to solar

By 2022, the French city of Verdun's whey plant will host the largest solar facility in the country, and the largest in Europe providing heat to an entire manufacturing facility. Our facility was built by Bordeaux start-up, NEWHEAT. This last will contribute to decarbonizing the heat produced by our plant. To this end, the Group deploys 15,000 square meters of solar thermal sensors and innovative storage solutions providing the necessary power for the site's new drying tower.

Transport & Logistics

We actively use transportation throughout our value chain, from the collection of raw milk to the delivery of our products to customers. There are multiple ways to reduce carbon footprint. For instance, we continually optimize our truck loading and the distance traveled. We also use alternative fuels whenever possible.

Truck sharing

In Spain, Lactalis partnered with a collaborative initiative led by CHEP, a provider of innovative logistical solutions.

Through the rollout of logistics platforms that are shared with manufacturers and distributors, we are in a position to reduce the number of miles traveled by empty trucks.

Every mile matters

Ak Gida, a Lactalis subsidiary, worked with Tirsan, the road transportation market leader in Turkey, to develop the High Capacity Trailer project. The initiative required two years of R&D to commission six large capacity tanks. The latter successfully transport 29,000 liters of milk (instead of the standard 24,500). This performance represents a 450,000 kilometer (280,000 mile) reduction in the annual distance traveled by its fleet.

Alternative fuels

In Italy, Galbani has developed liquefied natural gas (LNG) systems for its shuttles. This technology is more eco-friendly than traditional fossil fuels. In Sweden, Lactalis has committed to deploying a fossil-fuel-free fleet by 2025 with a focus on Hydrotreated Vegetable Oil (HVO) biodiesel. This 100% renewable alternative reduces carbon emissions by more than 90%.

+66%

LOADING CAPACITY for Spanish trucks thanks to Mega Trucks, representing 434 tons of CO_2 saved in 2020

Embrapa

nocarbon

PÁGINA INICIAL SOBRE NÓS ONDE ENCONTRAR

Saiba por que NoCarbon é bom para você e bom para o planeta.

Leite Carbono Neutro

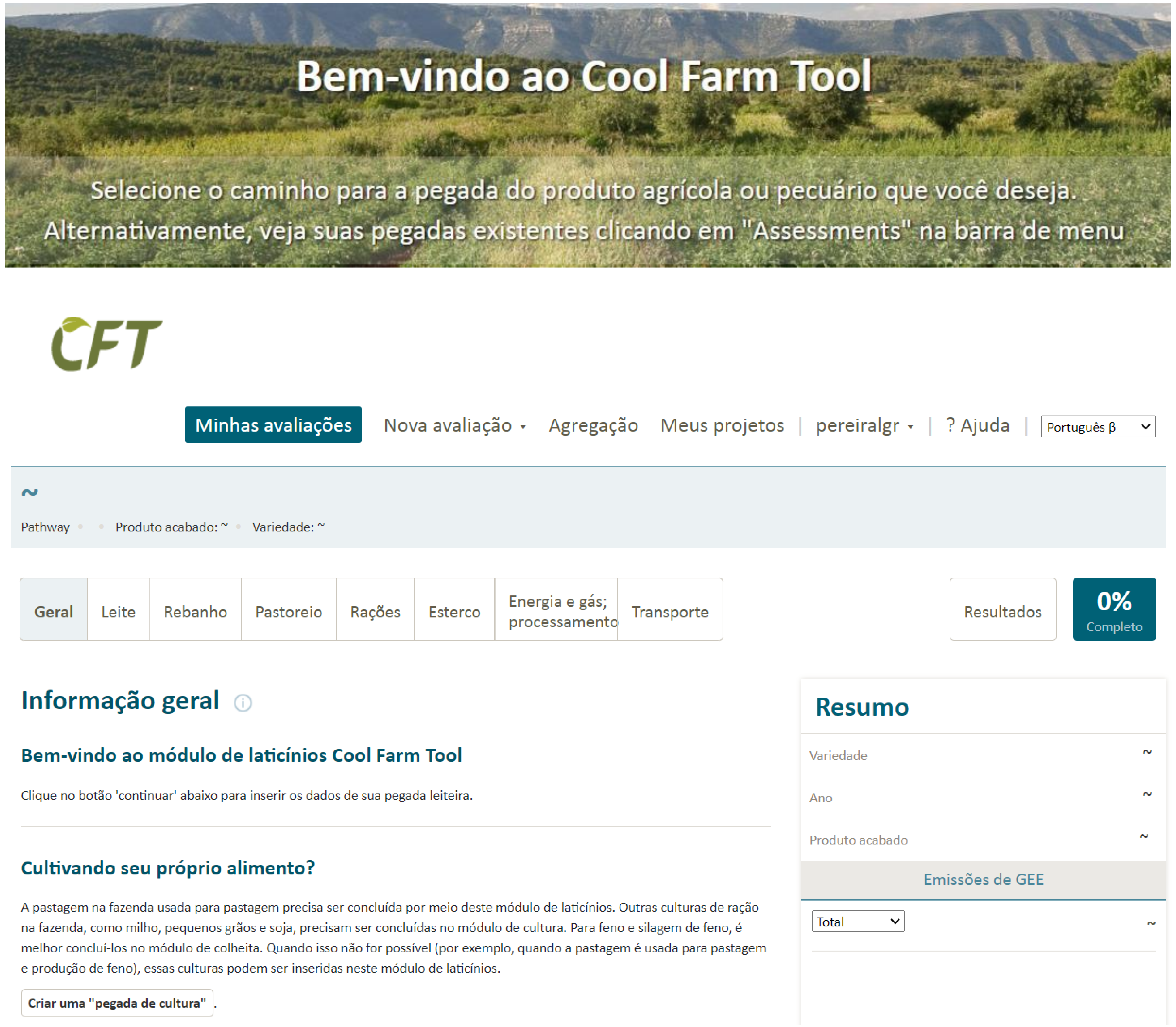
COOL FARM ALLIANCE

The Cool Farm Alliance is a unique community of organizations

working together to develop and promote a harmonized set of metrics for agricultural sustainability

Leite Carbono Neutro

PROTOCOLO COMUM DE AVALIAÇÃO DE PEGADA DE CARBONO



Leite Carbono Neutro

ROTA PARA DESCARBONIZAÇÃO/TRANSIÇÃO VERDE

- Alimentos e Nutrição (até 30% do CH_4 entérico)
- Genética Animal e Cruzamentos (até 40% da intensidade de emissão CH_4/kg de leite produzido)
- Interferência no Rúmen (Até 60% do CH_4 entérico)
- Saúde Animal (até 40% da intensidade de emissão CH_4/kg de leite produzido)
- Manejo de Dejetos (até 80% do CH4, redução de odores e até 40% do óxido nitroso)
- Manejo da Pastagem (até 40% da intensidade de emissão CH_4/kg de leite produzido)

Embrapa

Leite Carbono Neutro

Alimentos e Nutrição

NUTRIÇÂO DE PRECISÃO
+ a ++
$ a $$

SUPLEMENTAÇÂO ALIMENTAR
+ a ++
$ a $$

MELHORIA DA DIETA E SUBSTITUTOS (LEGUMINOSAS)
+ a ++
$ a $$$

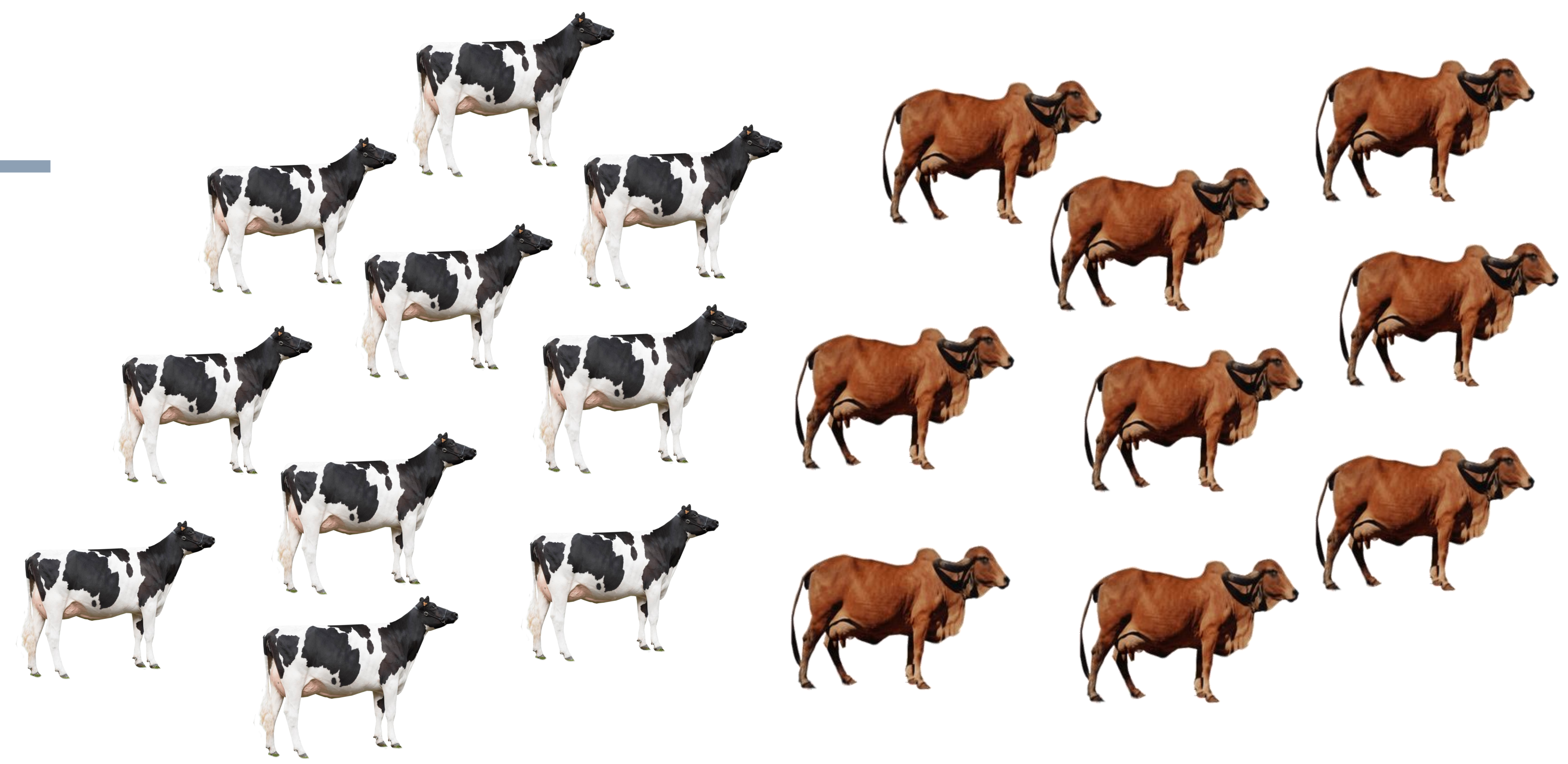
MELHORIA DA QUALIDADE DA FORRAGEM
++ a +++
$ a $$$

Prova de Conceito → Protótipos → Mercado

Embrapa

Leite Carbono Neutro

Genética Animal e Cruzamentos



NOVAS CARACTERÌSTICAS PARA EMISSÕES GEE
????????

ANIMAIS QUE APROVEITAM DIETA DE BAIXA QUALIDADE
++
$$

SELEÇÃO BAIXO CH_4
+ a ++
$ a $$

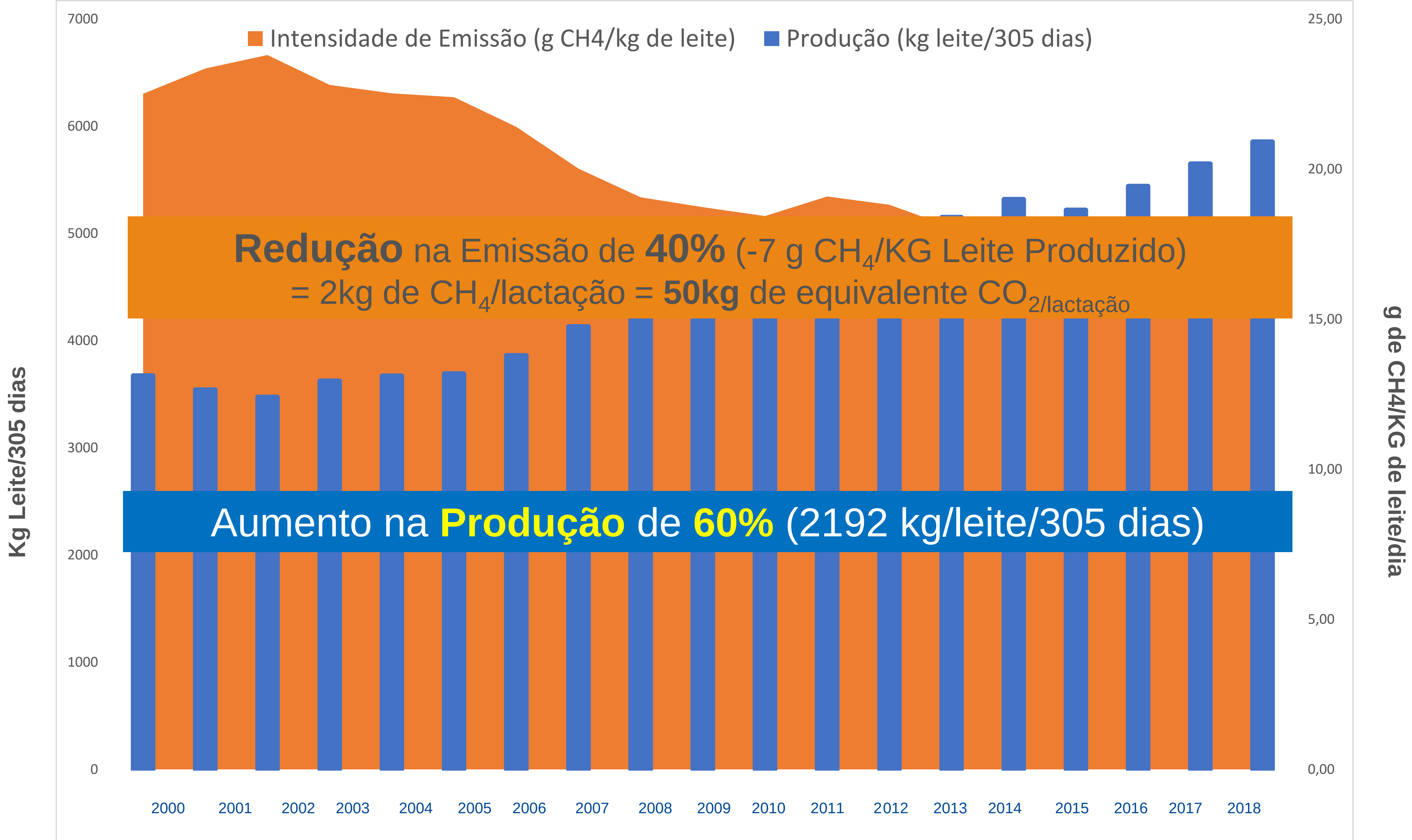
EFICIÊNCIA E LONGEIVIDADE
+ a ++
$$

Prova de Conceito → Protótipos → Mercado

Embrapa

Leite Carbono Neutro

Genética Animal e Cruzamentos

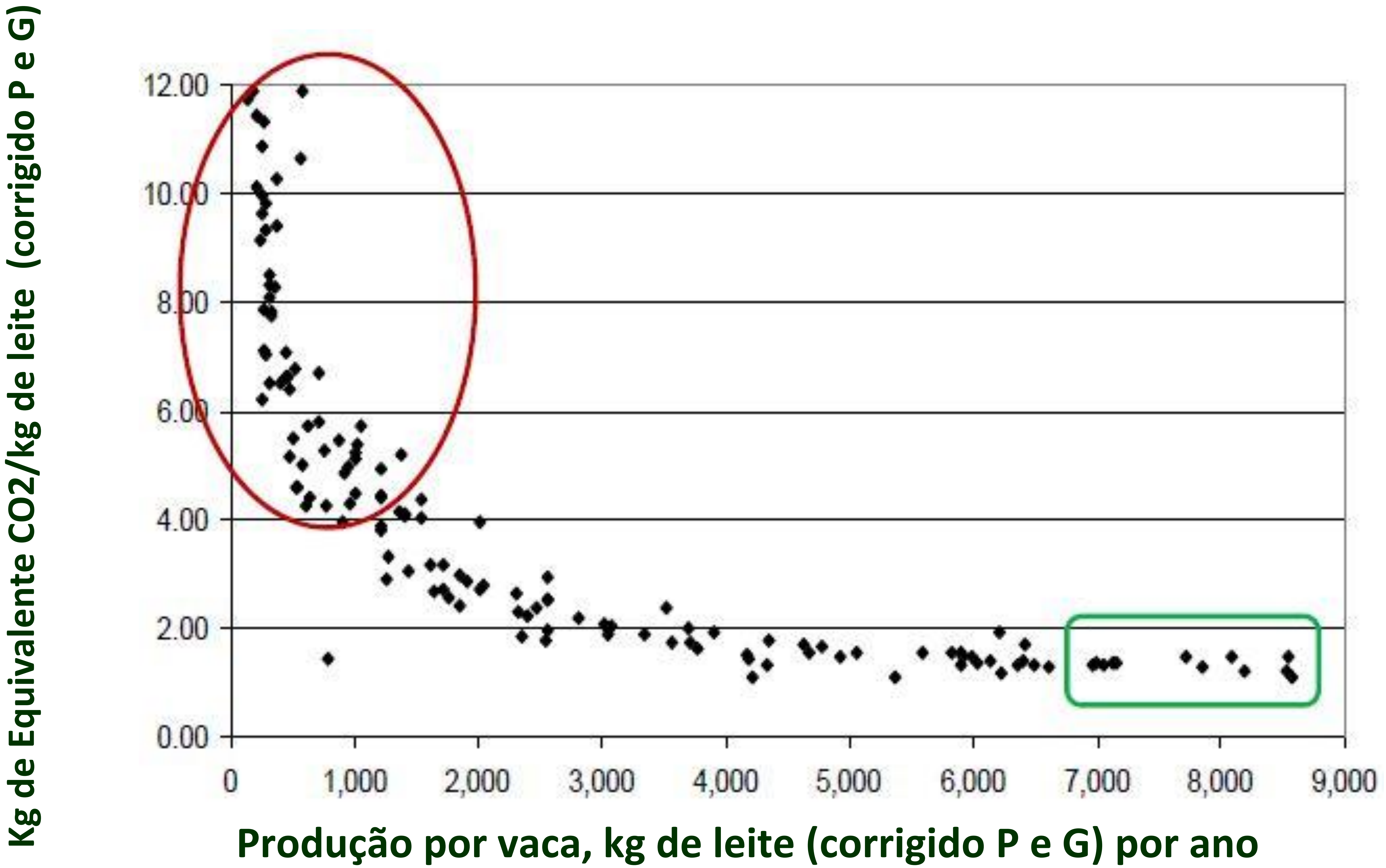


EFICIÊNCIA E LONGEIVIDADE
+ a ++
$$

Prova de Conceito | Protótipos | Mercado

Embrapa

Relação entre a emissão total de gases e produção de leite por vaca



Fonte: Gerber et al., 2011

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Interferência no Rúmen

TANSFERÊNCIA MICROBIOMA

?????

VACINAS

????

INIBIDORES METANOGÊNESE

+ a ++

$ a $$$

Prova de Conceito → Protótipos → Mercado

Embrapa

Leite Carbono Neutro

Saúde Animal

AUMENTAR A RESISTÊNCIA ÀS DOENÇAS
++
$ a $$

AUMENTAR PRODUTIVIDADE E LONGEIVIDADE
++
$ a $$$

PREVENÇÂO CONTROLE E ERRADICAÇÂO
++
$ a $$$

Prova de Conceito → Protótipos → Mercado

Leite Carbono Neutro

Manejo de Dejetos

TEMPERATURA E AERAÇÂO
+ a ++
$ a $$$

CAPTURA DE GAS ANAERÓBICO
+++
$ a $$$

COBRIR DEJETOS
++
$-$$$

APLICAÇÂO DE DEJETOS
+ a ++
$ a $$$

COLETA E ESTOCAGEM
+++
$ a $$$

Prova de Conceito → Protótipos → Mercado

Embrapa

Leite Carbono Neutro

Manejo da Pastagem

SEQUESTRO DE CARBONO
0 a ++

iLPF
0 a ++

MANEJO DE PASTAGEM
+ a ++
$ a $$

Prova de Conceito → Protótipos → Mercado

Embrapa

Leite Carbono Neutro

Impacto	▪ **Descarbonização** total ou geração de **créditos** de C ▪ Outros ganhos ambientais quantificáveis: redução de **resíduos** (N e P); maior **biodiversidade**; redução de **odores**
Maior Sustentabilidade	▪ Tecnologias de descarbonização aumentando produtividade e lucratividade ▪ Agregação de valor aos produtos lácteos ▪ Bem estar animal e para a sociedade
Protocolos	

Embrapa

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Enteric methane mitigation strategies for ruminant livestock systems in the Latin America and Caribbean region: A meta-analysis

Guilhermo Francklin de Souza Congio [a,b,*], André Bannink [c], Olga Lucía Mayorga Mogollón [a], Latin America Methane Project Collaborators1, Alexander Nikolov Hristov [d,**]

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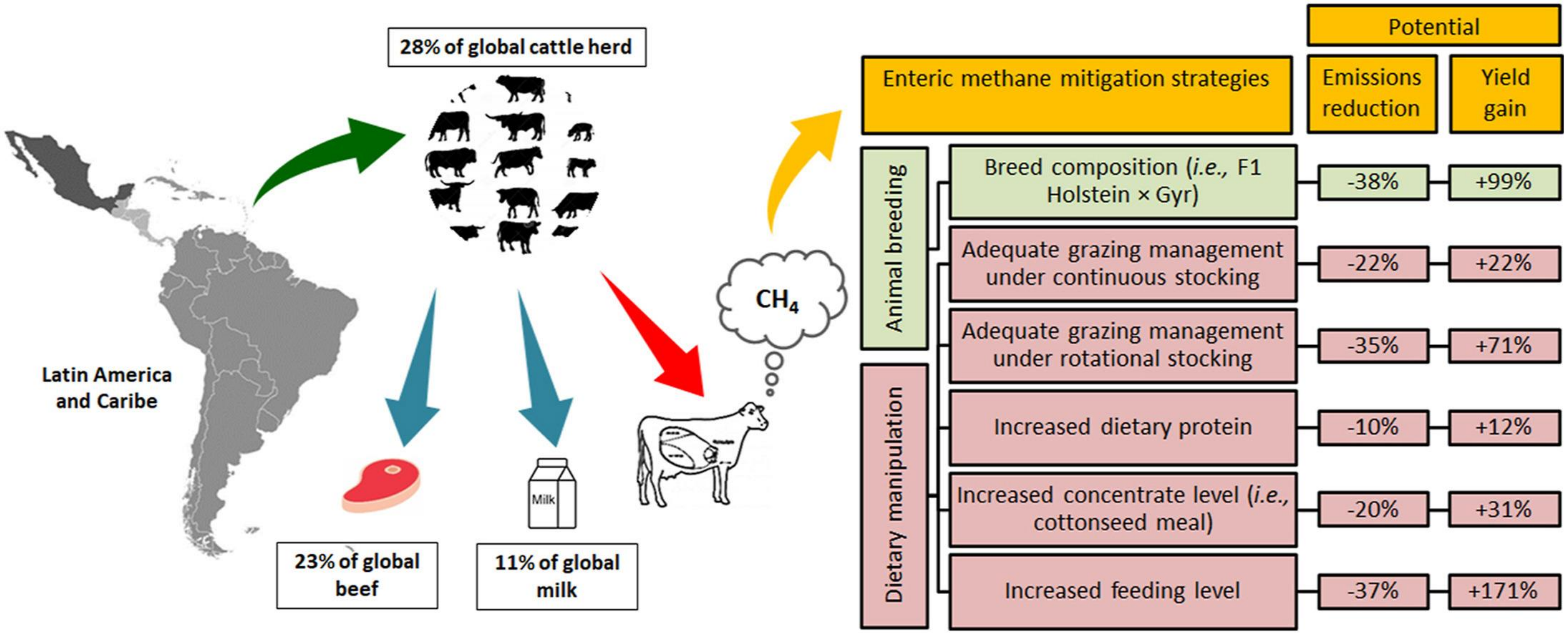
[c] Wageningen Livestock Research, Wageningen University & Research, Wageningen, 6700, AH, the NetherlandsThe Netherlands
[d] Department of Animal Science, The Pennsylvania State University, 335 Agricultural Sciences and Industries Building, University Park, 16802, PA, USA

Embrapa



Congio et al. (2021)

Considerações Finais

Informar na era da informação – Desafio e Oportunidade para mostar ao mundo que é possível produzir alimento de forma sustentável;

Transição verde/descarbonização direcionando a produção animal

Tecnologia como catalizador da eficência bioeconômica e leite carbon zero;

Embrapa

Embrapa
48 anos

Grato pela atenção!

Luiz Gustavo Ribeiro Pereira
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MINISTÉRIO DA AGRICULTURA, PECUÁRIA E ABASTECIMENTO
PÁTRIA AMADA BRASIL GOVERNO FEDERAL