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Uruguayan dairy partial carbon footprint

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Interinstitutional Group for the Livestock Environmental Footprint



Interinstitutional Group for the Livestock Environmental Footprint

Its a technical team from the ministries of enviroment, agriculture, INIA, INALE, INAC y UdelaR, aiming to incorporate the environmental dimation on the conceptualization of the production sistems.

3 working groups:

- **Carbon footprint (dairy and meat),**
- Soil and water footprint,
- Biodiversity footprint

Relevance and motivation

- The role of livestock sector GHG emissions (on CC), is an issue on global agenda.
- Public dialogue (national or international) on scientific bases and evidence
- Demonstrate the way Uruguay produce and its environmental performance.
- Provide differentiated goods to increasingly sophisticated and demanding customers.
- Comply with future or present requirements.

Methodological aspects

- ❑ **Indicator:** carbon footprint per product unit (CO₂ equivalent kilogram / milk kilogram)
- ❑ **Scale:** farm level individual estimates, grouped for reporting sake
- ❑ **Partial life cycle approach:** sistem conceived as “cradle to gate”
- ❑ **Methodological references:** IPCC (2006, 2019), IDF (2015), LEAP (2015)
- ❑ GHG Conversion metric: global warming potential 100 **AR2**
- ❑ **Data:** INALE-MGAP 2019 dairy survey (only industry integrated farms)

Footprint component and emissions estimation

- CH4 enteric fermentation**
- CH4 manure management**
- N2O manure management**
- N2O from urine and dung** deposited on managed soils
- Electricity usage**
- Land use for **feed production** : **fertilisers, machinery, seeds, herbicide**
- Feed imports**

*All activity data (quantity and quality) from the survey;
IPCC (2006) emission factors or coefficients*

Total emissions and carbon footprint

Model	Farms	Animal productivity	Stock rate	Milk FPCM	Total emissions CO ₂ eq. GWP ₁₀₀ AR ₂	Emissions/Kg FPCM
		L/VO/día	VM/ha VM	Gg	Gg	kg/kg
M1	426	9,8	0,92	35	49,16	1,387
M2B	217	12,0	0,75	42	52,41	1,238
M2A	214	16,2	1,09	45	47,93	1,058
M3B	200	15,1	0,71	75	80,08	1,068
M3A	232	19,5	1,06	85	75,10	0,883
M4B	215	15,9	0,81	150	169,67	1,129
M4A	219	19,7	1,28	150	145,49	0,967
M5B	187	19,4	0,91	323	321,68	0,997
M5A	173	21,4	1,23	319	284,37	0,892
M6	78	19,9	1,10	394	375,88	0,954
Total	2.161	18,5	0,99	1.620	1.601,78	0,989

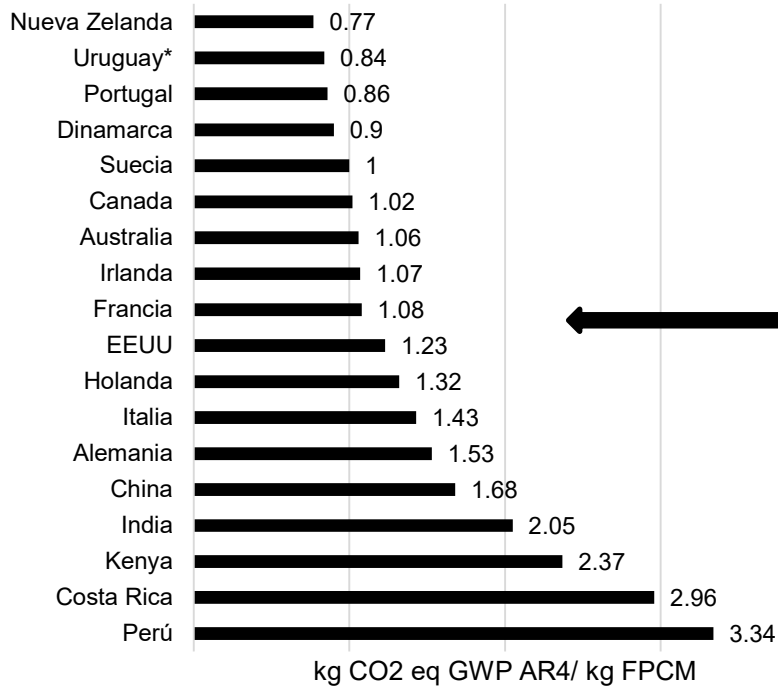
footprint **0,989** kgCO₂eq/Kg FPCM
(rank: [0,883 – 1,387])

Antecedentes:

- Darre y Llanos (2020): 0,97*.
- Lizarralde (2014): [0,96 – 1,09]*
- Mazzetto (2021): 0,77 to 3,34*

Total emissions: international comparison & metric sensibility

Dairy carbon footprint by countries. Mazzetto et al, 2021



Uruguayan footprint by metric

Metric	Emissions/Kg milk (FPCM)
GWP 100 AR 2	0,989
GWP 100 AR 4	1,091
GWP 100 AR 5	1,144

Footprint component distribution

	Total emissions Gg CO ₂ eq GWP ₁₀₀ AR ₂	Emissions/ Kg leche	Weight
CH ₄ emissions enteric fermentation	805,4	0,497	50,3%
CH ₄ emissions manure management	155,7	0,096	9,7%
N ₂ O emissions (MM, dung & urine)	417,5	0,258	26,1%
emissions from feed production	166,7	0,103	10,4%
CO ₂ emissions from electricity	1,8	0,001	0,1%
Emissions from imported feed	54,6	0,034	3,4%
Emisiones totales	1.601,8	0,989	100,0%

Antecedentes.
Astigarraga, Becoña et al.
(2013).

Fermentación entérica 56%,
Excreción N 22%,
Uso suelo 10%,
Manejo estiércol 7%,
Compra alimento 4%.

Remarks and future work

- ❑ Relevant indicator on environmental performance, though one more piece of a bigger environmental footprint
- ❑ Commercial, environmental, and public dialogue relevance.
- ❑ Improvements: methodological refinements, new IPCC parameters, incorporate more information, change grouping typification.
- ❑ What are the factors that affect the footprint the most?. Highly associated with productive efficiency → policy and action